DOCUMENT RESUME

ED 327 733 CE 056 827

AUTHOR	Griffiths, Gregory Peter
TITLE	Inland Waters Night Lighting Configurations: A Navigation Rules Course for Coast Guard Auxiliarists.
PUB DATE	13 Aug 90
NOTE	172p.; M.S. Thesis, New York Institute of Technology.
PUB TYPE	Dissertations/Theses - Master Theses (042)
EDRS PRICE	MF01/PC07 Plus Postage.
DESCRIPTORS	Behavioral Objectives; *Boat Operators; *Lighting; *Maritime Education; Military Personnel; Navigation; Postsecondary Education; Pretests Posttests; Sailing; Seafarers; Teaching Methods; *Training; Volunteers; *Volunteer Training
IDENTIFIERS	*Coast Guard; Instructional Systems Development

ABSTRACT

A project developed a training program to teach boaters to recognize and interpret properly the lights of other vessels in nighttime or other reduced visibility conditions in the inland waters of the United States. The project followed the Instructional Systems Design model in the development of the course. The target population were members of the U.S. Coast Guard Auxiliary interested in participating in surface operations. The training was required by a rewriting of the navigation rules promulgated by the Inland Navigation Rules Act of 1980. The Coast Guard Auxiliarists were trained to recognize the individual components that make up the entire lighting configuration of a vessel and interpret that information. The goal was not merely to memorize 50 or more different lighting configurations, but to be able to analyze the information and develop the overall situation. The instructional method was a guided discussion augmented with models and an application game. All participants passed posttests. (Project documents, including objectives, a study guide, diagrams of lighting configurations, and pretests-posttests, as well as 30 references are included in the report.) (Author/KC)

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THE SCHOOL OF MEDIA AND ARTS

of

NEW YORK INSTITUTE OF TECHNOLOGY

announces the

Final Examination

of

Gregory Peter Griffiths

for the degree of

MASTER OF SCIENCE

in

TRAINING AND LEARNING TECHNOLOGY

Inland Waters Night Lighting Configurations: A Navigation Rules Course for Coast Guard Auxiliarists

Abstract

This project developed a training program to teach a particular boater to recognize and properly interpret the lights of other vessels in nighttime or other reduced visibility conditions in the inland waters of the United States. The project followed the Instructional Systems Design model in the development of the course. The target population were members of the U.S. Coast Guard Auxiliary interested in participating in surface operations. The training was required by a rewriting of the navigation rules promulgated by the Inland Navigation Rules Act of 1980. The training taught the Coast Guard Auxiliarists to recognize the individual components that made up the entire lighting configuration of a vessel and interpret that information. The goal was not to merely memorize fifty or more different lighting configurations, but to be able to analyze the information and develop the overall situation.

Monday, August 13, 1990 at 4:30 p.m.

in

Conference Room, French Chateau
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INLAND WATERS NIGHT LIGHTING CONFIGURATIONS: A NAVIGATION RULES COURSE FOR COAST GUARD AUXILIARISTS

a

THESIS/PROJECT

by

GREGORY PETER GRIFFITHS

submitted to the faculty of the
School of Media and Arts

of

NEW YORK INSTITUTE OF TECHNOLOGY

in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

in

TRAINING AND LEARNING TECHNOLOGY

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INLAND WATERS NIGHT LIGHTING CONFIGURATIONS: A NAVIGATION RULES COURSE FOR COAST GUARD AUXILIARISTS

by

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B.S. 1975, U.S. Coast Guard Academy

A Thesis/Project
submitted to The Faculty of the
School of Media and Arts
of The New York Institute of Technology in partial satisfaction
of the requirements for the degree of

Master of Science

August 3, 1990

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ACKNOWLEDGMENTS

This project would not have been possible without the help of a number of people. These people did a great deal to make this project work.

Dr. Angus Reynolds wrote the thesis style guide and provided much needed guidance throughout this project's writing. The style guide provided the majority of the answers to countless questions. The counsel provided by Dr. Reynolds kept the designer on track and encouraged the designer to produce a quality product.

Carol Anne Griffiths, the designer's wife, who provided emotional and editorial suppport. She left the designer alone when needed and helped out when asked. This project would not have happened without her support.

Chief Warrant Officer Michael Pendleton, USCG, good friend and former co-worker, whose technical expertise and no nonsense review to the subject matter was a valuable asset to the project.

Petty Officer Matthew Leahy, USCG, good friend and former co-worker, whose ability to obtain research material when normal channels were blocked assisted greatly in this project.

The members of U. S. Coast Guard Auxiliary Flotilla 5-7, First Coast Guard District (Southern Region) who participated in the one-on-one and small group trials for their honest and uncompromising review of the materials. Without them the project would not have been as good as it was.

The graduates of the Spring 1990 Flotilla 5-7 boating safety course who came back for two more weeks of classes after finishing a thirteen week course. If it were not for them there would not have been an implementation.

Last but not least, Oscar's Bleu Day and Night, our Shetland Sheepdog, who kept me company throughout and provided much needed breaks from the word processor for outdoor exercise.

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CHAPTER 1

INTRODUCTION

Overview

Collision at sea is one of the three events that strikes terror in the hearts of most mariners. When a mariner hears a report of impending collision, fire or man overboard on a vessel that is underway, most immediately feel very alone, helpless and fear the worst is about to happen. The collision is considered important enough for U. S. warships to have a specific audible alarm to alert the vessel's crew of the impending collision. The collision alarm is one of the alarms tested daily both inport and underway. Warship crews are given training and drilled in damage control and keeping the ship afloat. Many of these drill scenarios are based on the types of damage encountered in collisions.

The need for a protocol to enable vessels to maneuver around each other without colliding to prevent collisions at sea between vessels is without question. Collisions at sea are disastrous from a financial, if not human, standpoint eg., the Andrea Doria and the Stockholm. These navigation rules are the subject of an international convention, The International Regulations for Preventing Collisions at Sea, 1972, also known as the 72 COLREGS. These COLREGS define the rights and responsibilities of vessels when they are in sight of one another. The COLREGS specify how vessels are to maneuver to avoid collisions, how vessels identify themselves during good visibility and reduced visibility conditions and establish criteria that gives vessels "right-of-way" over another.

During normal conditions of visibility such as daylight, the ability to detect another vessel and determine its intentions is not an exceedingly difficult task. Yet with the onset of night or other reduced visibility conditions, the task of detecting and identifying a vessel becomes more difficult. To properly maneuver in accordance with the COLREGS, an approaching vessel's direction of travel, what the vessel is engaged in, and whether or not the vessel is able to maneuver freely must be indicated. The proper identification of vessels during reduced viability by its lighting configuration is the purpose of this training program.

Background

Three seemingly unrelated circumstances arose in the early 1980s that precipitated the emphasis on knowledge of navigation rules for U. S. Coast Guard Auxiliarists. The enactment of the Inland Navigation Rules Act of 1980 (INRA 80), the deterioration of Coast Guard seamanship skills, and the advent of "Reaganomics" on the U. S. Coast Guard were the three circumstances.

The International Regulations for Preventing Collisions at Sea, 1972 addressed the high seas or international waters. Yet each sovereign nation is able to establish navigation rules for its own territorial waters. Prior to March 1, 1983 the navigable waters of the United States were covered by three different sets of navigation rules; the Inland Rules, the Great Lakes Rules and the Western River Rules. Not only were there three sets of rules, but these rules used archaic language, such as "steam driven vessels" for all motorized vessels. Additionally, specifically numbered rules within each set of the various rules addressed different topics, such as Western River Rule Number 1 did not address the same topic as Great Lakes Rule Number 1.

The Inland Navigation Rules Act of 1980 did several things. It combined all the existing rules into one set, the Inland Rules. It updated terminology to reflect the International Regulations for Preventing Collisions at Sea, 1972. It reorganized and rewrote the rules so that a specific rule addressed the same topic in both the International Rules and the Inland Rules. It addressed many issues that modern technology had previously not covered, such as Vessel Traffic Systems and Bridge-to-Bridge Radiotelephony.

In the late 1970s the U. S. Coast Guard recognized that its boat crews and ship crews were losing their overall proficiency. The Coast Guard was not as expert in small boat handling as their reputation suggested. The old unofficial motto "You have to go out, but no one said you had to come back" was causing Coast Guard small boat operators to take risks with their boats and personnel that should not be taken. Coast Guard coxswains were getting their boats underway on search and rescue cases in weather conditions impossible for any realistic chance of saving lives. Many Coast Guard boats were damaged on search and rescue cases that had little or no hope of success.

The small boat operators were not the only Coast Guard vessel operators having difficulties. The lack of professionalism in the Coast Guard was brought to light by two disastrous accidents. The Cutter Cuyahoga, the 125 foot training vessel for the Officer

Candidate School, while on a training cruise, crossed in front of a freighter in the Chesapeake Bay, was struck and sunk with the loss of eleven, many of them trainees. The Cutter Blackthorn, a 180 foot bouy tender, was stuck by a tanker and sunk in Tampa Bay with the loss of the Cutter and twenty-three crewmen. Both of these accidents were partially caused by the cutters' failure to properly interpret an approaching vessel's lights. Poor weather conditions played no part in either collision.

These accidents, as well as a number of aircraft mishaps, caused the Coast Guard to review its training programs, especially those of small boat crews. The Coast Guard found that its small boat training manual was merely a multi-page check list of tasks that were to be completed to become qualified in small boat operations. The check list was not in the form of performance objectives and contained no conditions, under which the task was to be performed, nor standards, to which the task was considered properly accomplished. Training from one small boat station to another was inconsistent. Training was so inconsistent that techniques and policies differed greatly on the three coasts, Atlantic, Pacific, and Gulf. This latter discovery of the differing techniques prompted the realization that there was no one accepted way of doing a particular task. Even the simplest task of belaying a line to a cleat had several "accepted" methods depending on where geographically Coast Guard personnel were stationed.

The last part of the puzzle was the election of Ronald Reagan as President of the United States. President Reagan brought "Reaganomics" to the United States, the cutting of the budget. The budget cuts reduced services. Where services were reduced President Reagan called on volunteers to take up the slack.

The Coast Guard was hard hit by these budget cuts. The emphasis of the Coast Guard's mission was made law enforcement, particularly drug interdiction. The Coast Guard's most recognizable mission had for years been maritime search and rescue. As more of its resources were shifted to drug interdiction, the Coast Guard's capability in search and rescue declined. This was compounded by an ever-shrinking budget. Much of the Coast Guard maritime search and rescue efforts had been devoted to recreational boating safety. These efforts were severely hampered, if not outright halted. Some small boat stations that serviced only the recreational boater were planned to be closed and all Coast Guard Boating Safety Detachments were disbanded. The Coast Guard looked to the Coast Guard Auxiliary for further help with its recreational boating safety mission.

The Coast Guard Auxiliary is the civilian volunteer component of the Coast Guard. The Coast Guard Auxiliary is involved in the Coast Guard's recreational boating safety mission and has three cornerstones. Those cornerstones are public education, vessel examination, and operations. In the operations cornerstone, Auxiliarists, members of the Coast Guard Auxiliary, using their own boats conduct safety patrols of recreational boating areas, assist distressed boats and boaters and are often called upon to conduct search and rescue missions. The Coast Guard is responsible for the training of the Coast Guard Auxiliary and must train an Auxiliarist before that volunteer is utilized by the Coast Guard.

A Coast Guard Auxiliary vessel, a vessel owned by an Auxiliarist, when operation under Coast Guard authorization is considered a public vessel of the United States. The Auxiliarists who are the crew of that public vessel are afforded indemnification against third party liability in case of a mishap. Therefore, the Coast Guard has a vested interest in the proper training of the Coast Guard Auxiliary.

When these three events happened at nearly the same time, the Coast Guard mandated that **all** Coast Guard small boat crews, regular, reserve and auxiliary, qualify under specific training programs. Crew members were required to demonstrate proficiency in line handling, communication procedures, first aid, small boat maneuvering, search and rescue planning and execution, damage control techniques, and navigation rules.

A training program in the navigation rules is needed enabling trainees to grasp the subject matter. If a person operating under Coast Guard authority fails to apply the navigation rules in a proper manner, the consequences can be disastrous as they have in the past.

Statement of the Problem

There is no method of instruction that the U. S. Coast Guard or U. S. Coast Guard Auxiliary uses to teach its vessel operators recognition of vessel lighting configurations other than pure memorization. There are more than fifty different lighting configurations that a vessel operator may encounter.

Purpose of the Project

The project is to enable Coast Guard Auxiliarists to identify and interpret the lighting configurations of vessels in inland waters of the United States. A systematic approach is needed to learn and understand navigation rules lighting configurations. A trainee can not be reasonably expected to memorize more than fifty different lighting configurations. Those trainees who can easily memorize or those who merely memorize may only know the facts but may not be able to interpret the information that the configuration is giving. The trainee must recognize the lighting configuration and interpret the information given in the lighting configuration. Vessel lighting configurations contain a wealth of information that can be vital to other vessels. They identify whether or not the vessel is underway, whether or not the vessel is making way, and the direction the vessel is heading. Navigation rules lighting configurations communicate to other vessels the activity in which the vessel may be engaged and what circumstances, if any, a vessel is in that other vessels need to be concerned, eg. unable to maneuver, aground, or not under command.

Definition of Terms

Mariners have a language of their own. To understand this project one needs to be familiar with a number of technical terms.

Vessel - Every description of water craft including nondisplacement craft and seaplanes, used or capable of being used as a means of transportation on water.

Power-driven vessel - Any vessel propelled by machinery.

Sailing Vessel - Any vessel under sail provided that propelling machinery, if fitted, is not being used.

Vessel Engaged in Fishing - Any vessel fishing with nets, lines, trawls or other fishing apparatus which restricts maneuverability, but does not include a vessel fishing with trolling lines or other fishing apparatus which do not restrict maneuverability.

Underway - That a vessel is not at anchor, or made fast to the shore, or aground.

Making Way - That a vessel is moving through the water by its own or another's propulsion.

Vessel Not Under Command - A vessel which through some exceptional circumstance is unable to maneuver as required by the Navigation Rules and is therefore unable to keep out of the way of another vessel.

Vessel Restricted in her Ability to Maneuver - A vessel which from the nature of her work is restricted in her ability to maneuver as required by the Navigation Rules and is therefore unable to keep out of the way of another vessel.

Masthead Light - a white light placed over the fore and aft centerline of the vessel showing an unbroken light over an arc of the horizon of 225 degrees and so fixed as to show the light from right ahead to 22.5 degrees abaft the beam on either side of the vessel.

Sidelights - A green light on the starboard side and a red light on the port side each showing an unbroken light over an arc of the horizon of 112.5 degrees and so fixed as to show the light from right ahead to 22.5 degrees abaft the beam on its respective sides.

Sternlight - A white light placed as nearly as practicable to the stern showing an unbroken light over an arc of the horizon of 135 degrees and so fixed as to show the light 67.5 degrees from right aft to each side of the vessel.

Towing Light - A yellow light having the same characteristics as the sternlight.

All-round light - A light showing an unbroken light over an arc of the horizon of 360 degrees.

Assumptions

1. The trainee is an Auxiliarists and, therefore, a U. S. citizen, above the age of sixteen.

2. The trainee has successfully completed a Coast Guard Auxiliary boating safety course including the Navigation Rules lesson.

3. The trainee has some simple boat handling experience.

Limitations

1. Due to the voluntary nature of the Coast Guard Auxiliary, permanent classrooms do not exist. The instruction must, therefore, be portable.

2. The Coast Guard can supply minimal support to the Coast Guard Auxiliary for audio-visual equipment such as overhead projectors, motion picture projectors, and flipcharts. Therefore, the availability of these items may be inconsistent.

3. Due to the voluntary nature of the Coast Guard Auxiliary, the cost and effort of preparing any visual aids must be borne by the instructor.

4. The instructional module may not be suitable in other type organizations, circumstances, times, or countries without appropriate modifications.

Method and Procedures

The method and procedure used to develop this instruction was based on the Joint Services Model of instructional systems design (Center for Educational Technology, 1976).

Analysis

The analysis phase consisted of four steps; needs analysis, task analysis, target population analysis and determination of entry level behaviors. The needs analysis seemed uncomplicated. The Coast Guard had mandated training for all small boat crew operating under Coast Guard authority. Part of this training was a demonstration of a thorough understanding of the navigation rules. Corroboration was sought to confirm that there was a need for the navigation rules training by researching documentation and present observations of small boat operations.

The task analysis was to come from the Inland Navigation Rules Act of 1980 itself. The intent was to conduct a training course that would cover the entire subject of navigation rules. A trainee had to demonstrate a clear understanding of all thirty-eight rules both Inland and International Rules covering the general rules, steering and sailing rules, lights and shapes and sound and light signals.

The target population analysis was conducted using a variety of sources. The Coast Guard Auxiliary has a management information system that records the voluntary efforts of its members as well as some personnel and administrative information. The intent was to utilize those records as well as personal observations and a telephone survey of the membership. The determination of entry level behaviors was to be an estimation of what knowledge a stereotypical trainee had obtained from experience and formalized education.

Design

The design of the course followed the general outline of the Parts of the Navigation Rules. A lesson covered a Part. Lesson one introduced the general rules and definitions. Lesson two covered the steering and sailing rules. Lesson three covered the lights and shapes. Lesson four covered the sound and light signals. Each lesson would have a quiz to be administered at the beginning of the next lesson. Performance objectives in accordance with Mager (1984) were written for every rule or subpart of a rule. Reading of the course material prior to class was to be the basis of a guided discussion format with liberal use of audio-visual materials.

Development

The development of materials was straight forward. A student study guide that had textual as well as note taking capability and included diagrams was to be the primary tool. An instructor guide assisted the instructor in presenting the course. Quizzes were developed to evaluate the trainee's progress and reinforce the material learned. A post test determined whether or not the trainee had met the course requirements.

Implementation

The course was intended for the members of the Coast Guard Auxiliary Mid-Manhatten Flotilla. Those members chosen were those interested in becoming qualified to participate in the operations cornerstone of the Coast Guard Auxiliary's recreational boating safety mission. This course prepared those interested members to take the navigation rules written examination of the boat crew qualification program.

Evaluation

Summative and formative evaluations were to be conducted. The summative evaluation was to be the comparison to the results of the post test verses the results of a pretest and a follow up interview two to three months after the course. The formative evaluation was to be a review of the content by a subject matter expert, a review of the instructional strategy and approach by an educator or other knowledgeable individual, and reviews by samples of the target population of the materials for ease of understanding.

Summary

Vessel operators must have a thorough understanding of the navigation rules to operate their vessels in a safe manner and avoid the potentially deadly consequences of a collision. Three circumstances joined forces in the early 1980s to require the training of Coast Guard Auxiliarists in small boat operations particularly navigation rules. These three circumstances were a rewriting of the Inland Navigation Rules, the realization by the Coast Guard that its own vessel operating proficiency had declined and successive Coast Guard budget cuts required the Coast Guard to rely on its civilian volunteers to do more and more.

The purpose of this project was to develop a systematic approach to learning the lighting configurations of vessels required by the navigation rules. Memorization of more than fifty lighting configurations is an impractical method of learning this material. In addition, memorization placed the emphasis on mere recognition yet ignored the interpretation of the information given.

The instruction assumes a certain level of familiarity with small boat operation by the trainee. The instruction needs to be portable and relatively low tech in its visual aid sophistication due to funding constraints of the parent organization and voluntary nature of the Coast Guard Auxiliary.

The instructional development followed the five step Joint Services Model. The analysis step included a needs assessment, task analysis and target population analysis. The analysis step utilized existing records, personal observations and a survey. The design step carried the project into organizing the tasks into logical groups and digestible chunks and determined the appropriate methods and strategies. The development of instructional materials was followed by implementing the instructions. Throughout the project evaluation was conducted of all aspects of the project. The evaluation not only determined whether or not the material presented was learned but it fine tuned the materials, instructional strategies and methods to produce meaningful instruction.

CHAPTER 2

ANALYSIS

Introduction

The analysis phase of this or any training project sets the tone for the project. An inadequate analysis makes life difficult for the designer, impacts negatively on the student, and wastes the precious resources of the organization. A well done analysis leads the designer to each successive step in the design process and conserves the designer's and the organization's time and efforts. An adequate analysis gives the student needed training without covering already learned material or skipping over necessary background information. A proper analysis paves the way for an outstanding end product.

The analysis does not only determine the existing performance gap. The analysis goes further looking into all the parts of the puzzle; the job tasks, the target population, and the organizational constraints. The job task analysis identifies all the subtask building blocks the trainee must possess to accomplish the entire task. The analysis of the target population determines what the prospective trainees are like; their general age, learning abilities, level of sophistication, and motivation. Analyzing your organization prevents the designer from developing training the organization can not deliver due to resource shortfalls or policy.

Needs Analysis

The need for Navigation Rules training for Coast Guard personnel was strongly indicated by the losses of the cutters Cuyahoga and Blackthorn. The National Transportation Safety Board in their Marine Accident Report of the Cuyahoga collision stated,

> "When the southbound Santa Cruz II was first sighted, the CO [Commanding Officer] of the Cuyahoga misinterpreted her lights to be those of a fishing vessel heading into the Potomac River." (National Transportation Safety Board, 1979)

Less than sixteen months after the loss of the Cuyahoga, the Coast Guard lost another cutter along with 23 personnel. If any uncertainty remained for the need for Navigation Rules training, the Commandant of the Coast Guard removed all doubt by mandating such training. Admiral John B. Hayes stated in his comments about the Marine Board of Investigation concerning the collision and loss of the cutter Blackthorn,

> "... A professional Rules of the Road [Navigation Rules] examination has been developed. Successful completion of this examination will be a prerequisite for an officer being assigned to duty as officer of the deck underway, commanding officer, or executive officer aboard Coast Guard vessels. The examination is similar in content to those administered to licensed officers of the Merchant Marine. ..." (U. S. Coast Guard, 1980)

This Navigation Rules requirement was interpreted as applying to coxswains of Coast Guard small boats, including the Coast Guard Auxiliary. Coast Guard Auxiliary personnel are required to demonstrate Navigation Rules proficiency by successfully completing task 2126 of the the U. S. Coast Guard Auxiliary Boat Crew Qualification Standards Manual (U. S. Coast Guard, 1985), a written examination covering the Navigation Rules.

The Coast Guard has compiled statistics concerning boating accidents since 1958. Table 1 shows that collisions with another vessel has been the most prevalent accident reported during the period 1984 to 1988. Collisions with another vessel injured more people than any other type of accident. Collisions with another vessel caused more property damage in 1985, 1986, and 1987 than any other accident, second only in 1984 and 1988 to fire or explosion of fuel. Falls overboard and capsizings were still the leading cause of fatalities among recreational boaters during the 1984 to 1988 period. Recreational boaters are required under 33 CFR 173-4 to report accidents they are involved in if the accident results in:

1. Loss of life, or
2. Personal injury which required medical treatment beyond first aid, or
3. Damage to the vessel and other property exceeding $200, or
4. Complete loss of the vessel.

It is noted that the Coast Guard estimated it receives reports for approximately ten per cent of all non-fatal accidents, while nearly all fatal accidents are reported.

The knowledge level of recreational boaters has always been an unknown. In 1988, 330,170 people enrolled in a Coast Guard Auxiliary boating safety course (U. S. Coast Guard, 1989). This appeared significant until one discovered that in 1988 there were 10,362,613 numbered boats in the United States (U. S. Coast Guard, 1989). The designer's experience showed that approximately one third of those enrolling in a Coast Guard Auxiliary boating safety course do not complete the course. This lack of knowledge was amplified by a telephone survey conducted in 1975 of victims of nighttime boating collisions that showed less than 50 per cent of

Table 1

Boating Accidents

1984-1988

Year	Total Accidents	Deaths	Injuries	Property Damage ($)
Collision with Another Vessel				
1984	1,905	70	1,003	4,425,900
1985	2,123	79	993	5,203,100
1986	2,108	86	972	4,957,900
1987	2,288	80	1,307	5,893,200
1988	2,351	76	1,321	6,187,900
Fire or Explosion of Fuel				
1984	347	4	187	5,734,000
1985	339	16	193	3,803,900
1986	379	6	171	4,084,700
1987	394	6	183	4,469,600
1988	385	5	176	7,117,100
Falls Overboard or Capsizing				
1984	1,047	656	401	903,700
1985	1,059	665	403	1,010,300
1986	1,079	647	412	1,080,800
1987	1,094	633	417	1,341,500
1988	1,058	565	508	1,371,800

those surveyed could not correctly identify what side of their boat the red light [port sidelight] was on (Stiehl, 1975).

The designer of this training program has had extensive experience with the Coast Guard Auxiliary, having worked with them for seven years as a Coast Guard officer prior to becoming an Auxiliarist three years ago. The designer has observed Auxiliarists participating in the operations cornerstone closely and has seen a tendency towards Auxiliarists securing from patrols as soon as possible to sunset. This tendency has had several different causes. A typical summer weekend safety patrol starts between ten o'clock and noon, by eight o'clock, the normal scheduled end of a patrol, the crew has reached the end of a very long, tiring day. Like recreational boaters, many Auxiliarists have seen, heard of, or been involved in numerous close calls. These close calls, like the unlighted vessel that came from nowhere or the commercial vessel that did not see you, have shaken many a boater's confidence. Debris, such as packing crates, telephone poles, and railroad ties, has caused a great deal of damage to boats. This sort of debris has been found in heavily trafficked waterways and has been virtually impossible to see at night. Reimbursement for repairs of an Auxiliary vessel damaged on patrol has been extremely slow, as the administrative process has been awkward. An Auxiliarist on patrol has learned a healthy fear and respect of the sea at night.

Job Task Analysis

The Job Task Analysis was not a difficult endeavor. The Inland Navigation Rules Act of 1980 had forced the Coast Guard to rewrite a publication, Navigation Rules, (CG-169). The format of the new Navigation Rules,(COMDTINST M16672.2A) had the International Rule, 72 COLREGS, on the left hand page and the Inland Rule, INRA 80, on the right hand page for the same rule. It was a simple matter to review Part C, Lights and Shapes, of the Navigation Rules, Rule 21 through Rule 31 to determine the lighting configurations a mariner in Inland waters might encounter. From these lighting configurations, the designer was able to amass a list of enabling tasks needed to understand the lighting configurations.

The Inland Rules, however, did not cover all the vessels a mariner might encounter in Long Island Sound. The U. S. Navy Submarine Base in Groton, CT posed a special problem. Submarines running on the surface were a particularly hazardous, yet routine, occurrence to both the submarine and other mariners. The normal navigation lights for a submarine could have been easily misinterpreted as a much smaller power driven vessel. This misinterpretation was reinforced by the small radar return of the submarine's sail by radar equipped vessels. The U. S. Navy authorized surfaced submarines to display a distinctive light in Inland and International waters. This authorization was published in 32 CFR 707. See Appendix A for the Job Task Analysis.

Target Population Analysis

The target population for the training was the members of the designer's Coast Guard Auxiliary flotilla interested in becoming qualified in vessel operations via the U. S. Coast Guard Auxiliary Boat Crew Qualification Program. Of the forty members in the flotilla, fifteen expressed a desire to participate in the training. The majority of the information came from flotilla management information reports. The Coast Guard Auxiliary had a management information system that gathered data concerning the performance of the Auxiliary and personnel data of individual Auxiliarists such as personal qualifications, address, and telephone number. From the reports the designer determined the length of time the Auxiliarist had been a member; the type of qualification held, such as instructor or vessel examiner; and the number of years that qualification had been held. The reports indicated the level of activity of the Auxiliarist, the number of missions an Auxiliarist had accomplished, public education lessons taught, and the number of hours spent on those missions. The reports gave an additional indicator of activity by stating the number of advanced in-house training courses the member had completed.

The designer had personal knowledge of the members' background and abilities. Some of the members were professionals; two lawyers, a neurologist, three educators, and a psychiatric nurse clinician. Other members of the target population were non-professionals with various educational backgrounds; a garage mechanic, a building superintendent, and a homemaker with a PhD in English Literature. The designer had taught a number of in-house training courses. This knowledge enabled the designer to establish the member's learning abilities.

Not all the necessary information was obtainable in the management information reports, the motivation of the members could not be measured in the reports. The designer conducted a telephone survey of the target population. The designer tried to determine the motivational level of the population and gather additional information not available anywhere else. The designer asked four specific questions:

1. In light of your personal schedule and voluntary nature of the Auxiliary, how much time are you willing to devote to training?
2. What type of boating do you do? Do you sail or power; take day trips only, multi day cruises anchoring at night, or weekday evenings?
3. How much of your underway time is spent at night?
4. Where do you do your boating?

In general, a member of the target population was a middle aged adult with at least a high school diploma. The member was a boat owner or had been in the past. Most of their boating was done on weekends during daylight conditions in coastal waters. The member had been in the Auxiliary for three to five years which meant that the member was a graduate of a Coast Guard Auxiliary boating safety public education course that included some elementary Navigation Rules exposure. The most significant discovery was that the member had only approximately four hours a month to devote to attending classes.

Organizational Constraints

The organizational constraints were simply money, space, and time. The Coast Guard did not have the resources to provide the Auxiliary with audio visual equipment nor classrooms. The individual Auxiliary members did not have a great deal of time to devote to training.

The Coast Guard had a limited budget for the administration of the Coast Guard Auxiliary. The Coast Guard was only able to provide the Auxiliary simple audio visual equipment, such as 35mm slide projectors, overhead projectors, and 16mm motion picture projectors. There was no funding available for the production of materials. If the desired training was about a topic outside the realm of readily available materials, the Auxiliary was on its own for the production those materials. The Coast Guard would assist in the planning and content accuracy of the material, but had no funds to produce it. The cost had to be born by the Auxiliary.

The Auxiliary did not have permanent classroom facilities of its own. Each Auxiliary flotilla had to find its own place to conduct meetings, training sessions, and teach public education classes. These facilities were not easy to find, especially if there was a monetary cost involved. Coast Guard facilities were made available to the Auxiliary when this use did not to interfere with normal operations. These facilities were few and the demand for them was great. These facilities were of varying size, capability and often crowded.

The time available for the members to devote to training was the most unexpected finding. This finding had the greatest impact of all the other organizational constraints. Time available to attend training had to be considered a organizational constraint. Auxiliarists were civilian volunteers; they could not be ordered to do anything. There was no administrative action that could be taken to compel an Auxiliarist to attend training if that Auxiliarist did not want to. There were requirements for qualification and requalification for an Auxiliarist to participate in an area. However, if an Auxiliarist did not met those requirements, that Auxiliarist did not participate in that area. There was no other administrative penalty that could be brought to bear forcing the member to comply.

Instructional Goal

The original purpose of the project was to enable Coast Guard Auxiliarists to learn, understand, and retain the Inland Navigation Rules. The Inland Rules were chosen because the patrol area of the designer's flotilla was in Long Island Sound. Long Island Sound was governed by the Inland Rules.

Knowledge of the Navigation Rules was mandated by the Commandant. The Coast Guard developed a fifty question examination for the Auxiliary to demonstrate knowledge of the Navigation Rules. The passing score for this fifty question examination was 90 per cent. The examination was very technical. It took numerous attempts for many Auxiliarists to pass this examination. The examination was so technically difficult, the designer of this program, a graduate of the U. S. Coast Guard Academy and a former deck watch officer aboard a Coast Guard icebreaker, was finally successful on his third attempt. In light of these difficulties and the need for Auxiliary boat crews qualified under the mandated Boat Crew Qualification Program, the Navigation Rules examination was rewritten by the Coast Guard to enable Auxiliarists to more readily pass. The new examination had twenty questions of a more general nature but retained a 90 per cent passing score. Still, there was no type of training program for the examination. One was expected to read the Navigation Rules and remember them. No program was in place to aid the Auxiliary in learning, understanding, and retaining the Navigation Rules. The Auxiliary was on its own to learn as best it could.

In the analysis, two things were discovered. A program that covered the entire Navigation Rules was a massive undertaking and beyond the scope of this project. In addition, the target population had a very limited amount of time to give to being trained. With these two factors in mind, the designer narrowed the scope of the project to cover just the lighting configurations used by vessels in reduced visibility conditions. This area could be reasonably and adequately covered in the available time and the designer felt this area was especially difficult and troublesome to Auxiliarists.

The Instructional Goal was, ultimately, to pass the Navigation Rules examination. The job task analysis showed a large number of objectives and enabling objectives. Those objectives were summarized into three instructional tasks:

1. Determine the direction the vessel is heading.
2. Determine what the vessel is doing.
3. Determine whether the vessel is under any special circumstance that may require you to be aware and cause you to take action.

Prior to the Navigation Rules examination, all examinations

Auxiliarists took were either open book with a 90 per cent passing score or closed book with a 75 per cent passing score. The designer opted for a closed book examination with an 80 per cent passing score. This would be an intermediate step toward the closed book with a 90 per cent passing score of the Navigation Rules examination.

There was only one specific requirement for the media used. The media had to utilize color! The Navigation Rules used color to differentiate between and signify various things such as sidelights, masthead lights, and sternlights. It was extremely important to use color in this training, not just use the letters R, G, W, Y, and B to signify a red, green, white, yellow, or blue light in a diagram. This made the training more realistic and enhanced its transfer to the work environment. All other methods and media were open for consideration if they did not interfere with the organizational constraints.

Literature, Existing Course, and Material Review

Related Theory

A trainee accomplished the instructional goals by recognizing various lights in the lighting configuration, interpreting their significance, and formulating the "big picture" from all the parts. The designer believed that Robert M. Gagne more accurately described the learning process required by this project than did Benjamin Bloom.

Bloom (1956) categorized three learning types of learning domains. Bloom defined the cognitive domain, as dealing with knowledge, comprehension, application, analysis, synthesis, and evaluation. The learning required in this program falls into Bloom's cognitive domain as opposed to to Bloom's psychomotor domain; dealing with actions, movement, and muscle coordination; or affective domain; dealing with feelings, attitudes, and values.

Gagne (1985) described five varieties of learned capabilities; intellectual skills, verbal information, cognitive strategies, motor skills, and attitudes. Bloom's psychomotor and affective domains closely resembled Gagne's motor skills and attitude varieties. Gagne described intellectual skills a "knowing how" or procedural knowledge such as converting centigrade to fahrenheit. Verbal information was described as "knowing what" or declarative knowledge such as Columbus sailed in 1492. Cognitive strategies were described as skills that managed one's own learning, remembering, and thinking such as recalling the main points of a lecture.

The designer believed that the instructional goal was accomplished by a combination of verbal information and cognitive strategies. Verbal information enabled the trainee to recognize that a red light shown above a green light indicated the vessel was sailing verses power driven. Cognitive strategies enabled the trainee to assemble all the parts of the puzzle into the "big picture." The sidelights or masthead lights indicated the vessel's heading. The masthead lights tell in what activity the vessel was engaged. The additional lights, if shown, alerted one to potential difficulties encountered due to that vessel's operation or circumstances.

Literature Review

1. Navigation rules (COMDTINST M16772.2A). (1983) Washington, DC: U. S. Coast Guard.

This publication was the single source document concerning the subject. If the designer had to choose one publication to prepare this project, the Navigation Rules would be that publication. It was interesting to note that the literature search sponsored by the New York Institute of Technology's library showed an obsolete version of this publication. The literature search criteria was any material concerning the Inland Navigation Rules Act of 1980 from the 1970s though the 1980s. The literature search reported a 1978 edition of this publication.

2. The coast guardman's manual (7th ed.). (1983). Annapolis, MD: Naval Institute Press.

This publication contained a brief discussion of the Navigation Rules concentrating on the responsibility of observing the rules and rules for maneuvering when within sight of another vessel. This publication was of minimal use for this project.

3. Maloney, E. S. (Ed). (1985). Piloting, seamanship, and small boat handling (57th ed.). New York: Hearst Marine Books.

In this publication the editor described the Navigation Rules basics for the recreational boater. The material consisted of a discussion of the arcs of visibility of lights and showed diagrams of recreational boat lighting configurations. This publication was complete, but was of little use for this project.

4. Boating skills and seamanship (10th ed.). (1988). U. S. Coast Guard Auxiliary.

This book was the text for the Auxiliary's power boat public education course. The Navigation Rules presentation was limited to arcs of visibility and lighting configurations of recreational boats and not useful in developing textual material for this project. The publication was critical in determining the entry level behaviors for the target population.

5. U. S. Coast Guard. (1988). Navigation Rules Part I Pamphlet No. D63101. (Available from U. S. Coast Guard Institute, Oklahoma City, OK).

This publication was the text for the Institute's Navigation Rules correspondence course. It contained excerpts from the Navigation Rules, although accurate, this publication duplicated material and was of little use.

6. U. S. Coast Guard. (1988). Navigation Rules Part II Pamphlet No. D63102. (Available from U. S. Coast Guard Institute, Oklahoma City, OK).

This publication was the study guide for the Institute's Navigation Rules correspondence course. It contained reading assignments, homework questions, and self quizzes. The diagrams in this publication were of great value in developing student study material.

7. U. S. Coast Guard Auxiliary boat crew manual (COMDTINST M16798.8. (1983). Washington, DC: U. S. Coast Guard.

This publication was the text for the Coast Guard Auxiliary's Boat Crew Qualification Program. The Navigation Rules section was thorough but its presentation of lighting configurations was limited to diagrams with captions and was of little use.

8. Boating statistics 1988 (COMDTPUB P16754.1). (1989). Washington, DC: U. S. Coast Guard.

This publication presented a compilation of all recreational boating accident statistics for the years 1984 through 1988. This publication was a great asset in determining the need for this project.

9. National Transportation Safety Board. (1979). Marine Accident Report - Collision of Argentine Freighter Santa Cruz II and U. S. Coast Guard Cutter Cuyahoga in Chesapeake Bay at the mouth of the Potomac River, MD, October 20, 1978 NTSB report No. PB293461. Washington, DC: Author.

The author described the accident and its causes. The conclusion concerning failure to properly recognize navigation lights at night was a prime factor in the needs assessment.

10. U. S. Coast Guard Marine Board of Investigation. (1980). Marine Casualty Report USCGC Blackthorn, SS Capricorn Collision in Tampa Bay on 28 January 1980 with loss of life (Report No. USCG 16732/01279). Washington, DC: Author.

The author described the accident and its causes. The conclusions concerning failure to properly observe the Navigation Rules and failure to train personnel were of great importance to the needs assessment. The Commandant's action of requiring Navigation Rules training was of great importance to the needs assessment.

11. U. S. Coast Guard. (1983). Course Book for Deck Watch Officer Navigation Rules Coast Guard Institute Pamphlet No. D63102.

(Available from U. S. Coast Guard Institute, Oklahoma City, OK).

This pamphlet was the text for the advanced course for deck watch officers. This pamphlet was of little use to the project as it duplicated the Navigation Rules.

12. U. S. Coast Guard. (1983). Course Book for Deck Watch Officer Navigation Rules Coast Guard Institute Pamphlet No. D46901. (Available from U. S. Coast Guard Institute, Oklahoma City, OK).

This pamphlet was the study guide for the advanced course for deck watch officers. This pamphlet was of little use to the project as it duplicated previously obtained material.

13. Stiehl, C. C. (1975). A Telephone Survey to Determine the Effects of Navigation Lights on Nighttime Collisions. Huntsville, AL: Wyle Laboratories.

This survey determined that lights had little effect on collisions. Boat operators were not blinded by their own vessel's lights. The survey had one finding that greatly influenced the needs assessment. It was discovered approximately 50 per cent of those surveyed could not properly identify what side of the boat the red light belonged.

Survey of Existing Courses and Materials

There were two courses and one computer program that could be utilized for Coast Guard Auxiliary Navigation Rules training. There were the Coast Guard Institute's Navigation Rules course and Deck Watch Officer Navigation Rules course. There was also a computer program that taught lighting configurations. There were other commercially available products, but they were rejected because of cost. Chapter one of 33 CFR tasked the Coast Guard with the training of the Coast Guard Auxiliary. It was Coast Guard policy that the Auxiliary would not be charged for training, because of their relationship to the Coast Guard as volunteers assisting in Coast Guard missions. Auxiliarists themselves bore the ancillary costs of training such as travel, lodging, meals, and lost wages; charging them for training was considered counter productive.

The Coast Guard Institute's Navigation Rules course was a self paced correspondence course providing general knowledge of the Navigation Rules. Each assignment was divided into three parts; the assignment objectives, reading material, and a self quiz. The course was technically accurate, but the readings were direct quotes from the Navigation Rules. This reading material was written in legal language and not easily understood. The assignments were to read the material and memorize it. The study questions did make an attempt to lead the student to associate that parts of each lighting configuration had their own significance and by assembling all the parts the "big picture" would evolve. This attempt was weak and undermined by the use of monocolor diagrams using letters to signify colors of lights.

The Coast Guard Institute's Deck Watch Officer Navigation Rules course was extremely similar to the Navigation Rules course. Its content, however, was much more technical than the Navigation Rules course. Deck Watch Officer Navigation Rules emphasized the technical annexes of the Navigation Rules, especially Annex II, Additional Lights for Fishing Vessels Fishing in Close Proximity.

This course had the same advantages and disadvantages of the other Coast Guard Institute course. It was, also, well beyond the scope necessary for the Boat Crew Qualification Program.

The Navigation Rules lighting configuration computer program was written by an Auxiliarist. In general, it showed a lighting configuration on a black background and gave four answers below the diagram. The student was to press the key of the appropriate answer. If the student chose the correct answer, the student was congratulated and moved on to the next diagram. If the student was wrong, the black background disappeared revealing the vessel with its lights and a narrative briefly explaining the right answer. Then, the computer program moved on to the next diagram. This format was good for drill and practice and a great deal of fun. The computer program was not the most effective method of teaching. A student could, after several tries, simply remember that the answer for this diagram was the second answer. This was little better than pure memorization. A student may have learned the lighting configurations, but not have been able to interpret the significance of the individual lights. An additional problem with the computer program was that it was written for the Commodore computer, which is not compatible with Apple or IBM. An Auxiliarist had to own a Commodore system to use this program.

Plan for Design and Development Effort

The designer chose to continue with the project. A job aid could solve the problem for vessel operators while they are underway. There were a number of plastic coated quick reference cards that could have been useful and were commercially available, however the color printing on the cards did not show up very well at night. Turning on the lights of the pilot house of a vessel at night to read the card would destroy a mariners night vision. Additionally, the Coast Guard had mandated that the examination covering the Navigation Rules was a closed book examination and the quick reference cards would not have been allowed in the classroom during the examination.

Estimated Student Effort

The student would spend a total of four hours or less in the classroom distributed over two sessions a week apart. That figure included the post test. The designer estimated that the student would need approximately one to three hours outside of the classroom to study the material sufficiently to pass the post test. The pretest was estimated to take approximately one half hour. The total student effort from pretest to post test was estimated to take between five and one half and seven and one half hours.

Time was not the only measure of student effort. The amount of concentration required of the student was also considered as effort. The intent of the instruction was to teach the student the basics of the lighting configurations, so that the student could synthesize the vessel from the parts of the lighting configuration. This approach was estimated to take a great deal less student concentration than that required of the shear memorization approach of other instructional methods.

Project Plan

The project was planned such that it would be completed in the

Spring of 1990. See Appendix B for the PERT and Gannt diagrams of the project plan. The PERT diagram was laid out in weeks verses days or hours. This seemed to be the most useful time frame considering this project was not a part of the designer's employment and done as a voluntary effort for the Coast Guard Auxiliary. Although the project was to end by May 1990, the evaluation continued into June. This was planned because evaluation was considered an ongoing process. This was especially true if this project were to be presented to the Coast Guard Auxiliary national leadership.

Budget

The budget was the designer's best estimate of the cost of the project. The labor costs were based on the estimated hourly wage the designer was paid by his employer. The other personnel costs were estimated based on the same wage figure applied to the designer.

Table 2 shows the overall budget. Table 2 shows that 95 per cent of the total were labor costs. The projected budget showed how much the Coast Guard and Coast Guard Auxiliary could get out of Auxiliarists. A training program that would cost $6,000 could be developed for a mere $300, because as volunteers Auxiliarists donate their labor.

Summary

The project analysis was a critical step in this project. Without an analysis, the designer would not have known that the

Table 2

Project Budget

Expense	Designer Hours	Other Hours	Cost	Subtotal	Total
Labor					
Analysis	70	0	$1,155		
Design	67	0	1,105		
Development	125	0	2,062		
Implementation	20	20	660		
Evaluation	10	10	330		
Total Labor				$5,312	
Materials					
Photocopying			$150		
Visual Aids			75		
Stationary			25		
Computer Supplies			25		
Total Materials				$275	
Grand Total					$5,587

original intent of the project was too massive. Nor would the designer have known that the target population had a very limited amount of time to devote to class attendance. These were the two major findings of the analysis phase of this project. Had these two facts not be discovered, the project would have been doomed to failure at worst, or minimal usefulness at best.

The analysis phase showed whether there was a need and whether the solution to that need was best accomplished by training. The analysis further showed what was needed, or the scope of the training. The analysis gave a profile of a stereotypical student. It determined the student's general learning abilities and motivation to learn. The analysis indicated what difficulties the designer might encounter as far as the organization was concerned. The designer would not develop a training program using methods and media that the organization would not or could not support.

In short, the analysis prevented the designer from wasting resources, both time and money. It indicated a need for training, not just a problem of management failing to manage. The analysis guided the designer along the proper path by designing training that was really needed, not just what was thought needed. The analysis prevented the designer from following methods and using media that would not be used.

CHAPTER 3

DESIGN

Introduction

The analysis phase was completed. A determination was made that a need existed; there was a shortfall between reality and expectation. It was determined that training was the best method to fill in that gap between expectation and reality. The next step was to design the training.

In designing training, decisions were made concerning what to teach, how much to teach in each session, and in what order to teach the material. The design phase included the determinations how to teach, how to measure the amount of material learned, how to "fool proof" the instruction, and how to ensure learning stayed with the student after the training was completed.

Instructional Task Analysis

The designer conducted an instructional task analysis at the same time as the job task analysis. In the previous chapter, it was learned that the job task analysis was a relatively simple undertaking. The designer reviewed the Navigation Rules for the job task analysis. As each individual task was identified, the points of knowledge or enabling objectives necessary to accomplish that task were also identified. If the task involved utilizing masthead lights, such as determining the direction of travel by masthead lights alone, the trainee must be able to define masthead lights or describe their characteristics.

The overall project goal was divided into three instructional tasks. These tasks were designated:

1.0.0. Determine the direction the vessel is heading,

2.0.0. Determine what the vessel is doing, and

3.0.0. Determine whether the vessel is under any special circumstance that may require you to be aware and cause you to take action.

The individual instructional sub-tasks that contributed to accomplishing the three instructional tasks were designated utilizing the second digit. For example, instructional tasks were numbered 1.1.0., 2.4.0., or 3.8.0. The sixth instructional sub-task of the second instructional task was designated 2.6.0. If the instructional sub-task did not stand alone and needed additional division, instructional sub-sub-tasks were designated utilizing the third digit. The instructional sub-sub-task to define masthead lights was designated 1.2.1. and the instructional sub-sub-task to define a sailing vessel was designated 2.14.1. A list the the insructional task, sub-tasks, and sub-sub-tasks is in Appendix A.

Instructional Objectives

The designer believed preparing the instructional objectives was the single step that had the greatest impact on the entire ISD process. All the other steps and procedures in the ISD process were important and had their place. Yet, the preparing of instructional objectives communicated to all involved what had to be done, how well it had to be done, and under what conditions it had to be done. The designer, in writing the instructional objectives, told the trainee and instructor what was expected. The instructional objectives also communicated the designer's understanding of management's intentions for the project.

According to Mager (1984) a proper instructional objective containes three components; performance, conditions, and criteria. These components described what must be done, under what circumstances it must be done, and how well it must be done.

The performance, or what must be done, was stated in clear, unambiguous, concise, and measurable terms. The performance, as suggested by the word performance itself, was expressed as a verb. The verb was observable or measurable such as list, define, assemble, or tie. The selection of these verbs was slightly complicated by Bloom and Gagne in their various domains of learning. One had to choose the performance verb carefully to accurately portray what was intended. To "know" how to do a task was not specific enough. If the task belonged to the cognitive domain, one listed the steps necessary to change a tire or defined a term. If the task belonged to the psychomotor domain, one changed the tire. If the task were attitudinal in nature, one described the reason behind keeping your tires properly inflated.

The conditions, or under what circumstances the performance must be done, explained the environment in which the performance was accomplished. The conditions stated whether or not resources, texts or notes, could be used. The conditions also stated whether the performance would be conducted in a classroom or field environment among other considerations. In short, the conditions told the trainee what could be used in the performance.

The criteria, or how well the performance must be done, explained what was successful completion of the performance. The criterion demanded the trainee fulfill certain standards, list a particular number of items, or established a time frame among other considerations.

This project had 63 instructional objectives. These are presented in Appendix C. Each was written in a two sentence format as follows:

-Sentence One

Given (state the conditions), the student will (state the performance exactly the way the task statement or subskill is stated).

-Sentence Two

The (performance) must be (state the criteria).

Mager seemed to believe the ARMY AXIOM, "An order that can be misunderstood will be misunderstood" (Dickson, 1978). Therefore, he designed instructional objectives with that axiom in mind.

Entry Behaviors Defined

In the job task analysis, the designer divided each task into the various components that made up that task. Those components were further divided and redivided until a component could no longer be split into sub-components or sub-sub-components. An instructional objective was written for each of these lowest divisible components.

Not every trainee needed instruction in every component. Each trainee brought some amount of nautical education and experience to the course. It was unnecessary to present instruction on a topic the trainee already had mastered.

In analyzing the target population, a lowest common denominator was sought. It was found that all members of the target population graduated from a Coast Guard Auxiliary boating safety public education course. This course contained some rudimentary navigation rules information. As far as lighting configurations were concerned, the boating safety course limited itself to those lights legally required aboard recreational boats.

The boating safety course curriculum was compared with the project's instructional objectives. If an instructional objective of the project duplicated the boating safety course curriculum, the instructional objective was considered an entry level behavior. Of the 63 instructional objectives, 19 were considered entry level behaviors. These entry level behaviors are indicated by **bold** type in Appendix C.

Group and Sequence Objectives

In grouping and sequencing objectives, the designer assembled the instructional objectives into those of similar nature and into a logical flow. The grouping of objectives followed the intent of the three instructional goals. Each instructional goal became an individual lesson. The sequencing of the objectives was simply an objective decision of the designer. The objectives were sequenced according to what the designer believed the trainee was more likely to encounter on the water as compared to other lighting configurations in the Navigation Rules.

The second lesson quickly became the longest lesson. This lesson enabled the trainee to recognize what a vessel was, such as a sailing vessel, a trawler, or a simple power driven vessel. The designer decided Lesson Two was too large and decided to include the recognition or identification of power driven vessels in Lesson One. This included the identification of air-cushion vehicles in non-displacement mode, recreational vessels less than 12 meters in length, and surfaced submarines.

Lesson Three concerned vessels in various states of non-maneuverability. These vessels presented a particular problem to mariners because one may not be able to claim right of way over them. You could be directed by the rules to "stand on" your course and speed in a normal crossing situation. However, if the other vessel is restricted in her ability to maneuver such as towing the U.S.S. Missouri on a short towing hawser or launching aircraft, you could automatically become the "give way" vessel. The designer believed that the discussion of a minesweeper belonged in Lesson Three along with other potentially "hazardous" vessels.

This left Lesson Two a more manageable size. Lesson Two discussed sailing vessels, towing vessels, towed vessels, fishing vessels, trawlers, and pilot vessels.

Learning Activities Specification

Within each lesson there were two specific learning activities; present the material and apply the material. These two learning activities were the same from lesson to lesson.

In the material presentation activity the material and target audience were analyzed. The material was very technical in nature, there was a great deal to present, and the material was not open to interpretation. This seemed to support a lecture as a good instructional method (Laird, 1985). Yet, the lecture option was a one way flow of information and did not allow for participation by trainees who had experiences relevant to the topic. The sharing of experiences was valued by the designer to foster a climate of mutual respect in the learning process (Knowles, 1987) and gained validity for the training by the trainees. The designer decided to use a guided discussion approach to present the material. This allowed the material to be presented in a reasonably quick manner and allowed for trainee input.

The guided discussion could not stand alone and needed aids. Anderson's (1983) media selection process suggested hand-outs, easels, chalkboards, charts used by the instructor, slides, transparencies, film strips, holograms, actual objects or models. Due to the limitations of funding and no permanent classroom, hand-outs, models, and, if available, chalkboards seemed the best media to assist the guided discussion method.

The second learning activity followed Knowles' (1987) suggestion to make learning fun and make the learning meaningful. A simulator (Keiser, 1987) of the material, that had the flavor of a game, was designed as a reinforcement of the learning. The simulation gave practice, gave feedback to the instructor and student, added fun to the learning experience, and converted the three dimensional models into a two dimensional medium. This last consideration assisted the trainee by preparing them to take the pencil-and-paper post test.

The design of the instructional stragegy followed Gagne's (1985) nine step model rather closely. The attention gaining and providing motivation was done by presenting a mini case study of the _Cuyahoga_ collision paying particular attention to the misinterpretation of the _Santa Cruz II_'s lights by the Commanding Officer of the _Cuyahoga_. The expectancy, informing the trainee of what was expected, was covered in the study guide's introduction and the instructor's opening remarks. A brief review of the boating safety course learning stimulated recall of prior knowledge. The guided discussion, taking notes in the study guide, and models presented the material to learn. Verbally quizzing trainees periodically throughout the lessons and the use of the memory aids such as "Red over Green, Sailing Machine" and "Red over White, We'll be Fishing all Night" provided learning guidance. The simulation game elicited performance, provided feedback, assessed the performance of all trainees, and enhanced retention. The post test also reinforced the last four steps. The post test had the added benefit of quantifying the results.

Assessment System Specification

The designer statisically compared pretest results with post test results. A pretest is intended to accomplished two things, measure whether or not the trainee possessed the entry level behaviors and measure how much of the subject matter the trainee had mastered prior to training. The pretest would be divided into two sections. The first fifteen questions would deal with the entry level behaviors. The second ten questions would deal with the subject matter. The comparison would utilize the last ten questions of the pretest against the post test.

Evaluation System Specification

A formative and summative evaluation of the training was intended. These evaluations would follow the steps outlined by Dick and Carey (1985) and Phillips (1983).

The formative evaluation planned to follow a four step process. Once the instructional material was drafted it was to be reviewed by subject matter and instructional experts. After that review, the material would undergo one-on-one, small group, and field trials. At each step, the material was to be revised if it was found to be lacking. The one-on-one, small group, and field trials were to be conducted using members of the target population. During these reviews and trials, the material would be critiqued for accuracy, logical flow, clarity of instructions, usefulness of diagrams, and typographical errors. In essence, the formative evaluation asked, "Do the parts work?"

The summative evaluation would determine whether or not the course met its objectives. A statistical comparison of the pretest and post test results would show whether or not learning had taken place. In addition to the statistical comparisons of the tests, a reaction questionnaire would be developed and given the trainees after the end of the course. The reaction questionnaire would measure the feelings of the trainees towards the course; whether the course was useful, did it met the trainee's expectations, would the trainee recommend the course to others, and what could be done to improve the course.

Learning Transfer System Specification

The target population was, as described in Chapter 2, was composed of volunteers. There were no administrative penalties one could impose on a volunteer who does not attend training or utilize training after attending a course. The worst that would happen to an auxiliarist who failed the Boat Crew Qualification Program Navigation Rules examination was they would not become qualified as a vessel operator. This meant that the individual auxiliarist could not accept orders to go on operational missions. However, this did not prevent auxiliarists from going on operational missions as a crew member on another boat or as a crew member aboard their own boats if a vessel operator was available to accept the orders. The challenge was to entice the auxiliarist to come to the course and use that training after the course was complete.

To peak the auxiliarist's curiosity, a series of newspaper articles concerning lighting configurations could be sent to each student prior to the course. Quizzes of a fun nature concerning lighting configurations could be placed in the flotilla's monthly newsletter. The course could be publicized in the weeks prior to its deilvery. This publicity could include the course objectives.

Review and Selection of Existing Materials

There were few existing instructional materials that were useful in this project. The designer decided not to use commercially available materials because of the requirement to obtain the author's permission. The designer further decided not to use commercially available materials due to their cost. The Coast Guard is responsible for the training of the Coast Guard Auxiliary and does not have the funds to purchase large quantities of commercially available training materials. The designer concentrated on materials in the public domain as potentially useful in this project. Two items were identified and evaluated as useful. These items were diagrams and "flash cards".

The Coast Guard Institute's Navigation Rules Part I pamphlet had clear and sharp diagrams of vessels. These diagrams were suitable for the student study guide. The diagrams showed bow, side, and stern views of a vessel less than 50 meters in length and 50 meters in length or greater. The lighting configurations on these diagrams were removed leaving only the vessel outline. These generic vessels were placed in the student study guide where needed. The student filled in the diagrams with colored pens, pencils, or markers as the vessel configuration was discussed.

The "flash cards" came from the Coast Guard Institute's Navigation Rules course. On one side a card showed a black background with a side aspect of a vessel lighting configuration; the bow, stern, and other side were also shown, but in smaller scale. The reverse side of the card had a description of the vessel depicted and stated the appropriate rule or rules covering that lighting configuration. These cards were used as the card drawn by the student during the application activity.

Summary

In the design phase some of the most important work of the project was accomplished. The analysis phase determined the need and who was in need. The Design phase determined what was and was not included in the training, in what order it was presented, how it was presented and how learning was measured among other considerations.

One of the most critical steps within this phase was the preparing of instructional objectives. Properly prepared instructional objectives greatly enhanced the quality of the entire project. Instructional objectives stated what specifically had to be done, under what circumstances it had to be accomplished, and how well it had to be done. Properly constructed instructional objectives were, in essence, a blueprint for the rest of the training.

CHAPTER 4

DEVELOPMENT

Introduction

Many novices to the field of instructional development start with this phase of the project. They mistakenly believe that to develop a course one simply starts writing the text, study guides, and tests. These materials are important, but there is much more to consider in this phase as well as what lead one to this phase.

In this phase, the designer continued with the ideas of the design phase and made those ideas reality. The designer developed media that aided the intended methods of delivery. Materials were developed to collect data for evaluation purposes. Those methods and media were reviewed by instructional and subject matter experts. Printed material was proof read.

Learning Activity Development Scheme

As stated in Chapter 3, the designer specified two learning activities in each lesson. These learning activities were to present the material and apply the material.

In the material presentation, the designer chose a guided discussion method. This method used only one of the five human senses, hearing. To enhance this method, the designer wanted to add the sense of sight to the learning activity. Media that included the sense of sight were sought to add to the guided discussion. Two media suggested by Anderson (1983) were targeted models and a study guide that the trainee could take home.

A third item was necessary to properly conduct the guided discussion. Most Coast Guard Auxiliary instruction relied on the expertise of the instructor. Those training courses assumed the instructor was also a subject matter expert. Finding a good instructor who happened to be a subject matter expert was not an easy task, especially in the area of navigation rules. The guided discussion needed either a subject matter expert as its leader or detailed notes to an instructor concerning the subject matter.

The second learning activity was to apply the material learned. This required the trainee to utilize the material just presented. This reinforced the learning. The application tool was to as closely as possible represent lifelike conditions. The designer had considerable experience teaching Cardiopulmonary Resuscitation (CPR). The designer saw that numerous people could easily perform the individual skills such as rescue breathing, clear an obstructed airway, and CPR itself. The students knew, or quickly discovered, they were only required to demonstrate the individual skills and not required to combine skills. If rescue breathing was being taught, only rescue breathing would be covered. The designer began "throwing curves" at students. During the performance of the last skill, the designer would tell students that the "victim" had a malady that required the student to perform a previously learned skill on the "victim" before proceeding. This required the student to remember the previously learned skills and to "think on their feet." The designer also hated unrealistic training. Man overboard drills aboard vessels were usually timed.

The clock started then "Oscar," the man overboard dummy, was thrown over the side. The clock was usually stopped when the first thrown heaving line landed across "Oscar" and the drill was terminated. This elapsed time allowed the coxswain or conning officer to evaluate their ship handling abilities, but was unrealistic in that the rescue teams never got the chance to practice their skills of recovering a victim from the water. Maneuvering a vessel alongside a victim is rather a different task, than hauling a fully dressed, unconscious, 250 pound victim out of the water, over a three foot freeboard, and onto the deck! To illustrate that point, the designer played the role of "Oscar" by jumping over the side during a man overboard drill on a Coast Guard Auxiliary training mission. The vessel operator brought the vessel alongside the designer in less than a minute. The recovery phase lasted approximately five minutes and involved all three members of the crew including the helmsman, who had to temporarily abandon the helm to assist in the recovery.

The learning activities were not limited to the lessons. The trainee had to possess the entry level behaviors prior to the training, the learning needed to be measured, and trainees given feedback. A pretest and a post test were intended to answer those concerns.

Learning Activity Development

The designer developed a student study guide, models, and an application tool that took on a game-like format. Each component was developed independently from the others, although they were designed to work in conjunction with each other. The designer did not develop a detailed set of notes for the instructor. The course implementation date arrived before those notes could be developed. This was of little consequence because the designer presented the course. If additional courses are planned that the designer cannot teach, then these detailed instructor's notes will be a necessity.

The study guide was the tool the student used to learn the course material. It contained four sections; introduction, lesson one, lesson two, and lesson three. The introduction expressed the intent of the course and how the study guide assisted in learning the material. The introduction gave the course objectives:

1. Determine the direction the vessel is heading,
2. Determine what the vessel is doing such as fishing, towing, and pilotage duty, and
3. Determine whether or not the vessel is under any special circumstances you need to be aware off such as aground, or unable to maneuver.

The study guide went on to again explain the purpose of the pretest and inform the trainee of the post test. In the introduction of the post test, the format was presented as well as its passing score. The remainder of the study guide was split into three lessons, each covering a course objective. Each lesson asked questions pertaining to that lesson's material, and these questions were the basis of the guided discussion. After each question, space was provided for the students to write notes. A generic diagram of a vessel was placed in the study guide after each vessel's lighting configuration was discussed. The diagrams were blank. The students would color in the diagram using pencils, pens, or markers. The student study guide is shown in Appendix D.

Models were the tool the instructor used to present the material. These models were the prime visual aid in this course. They would illustrate the points that came out of the guided discussion. The models had to be simple in design and relatively small because, as stated in Chapter 2, the course materials had to be portable. The hull of the models were an 18 inch long 1X6" board with holes drilled in the appropriate places for lights. The lights were 1½ inch diameter styrofoam balls painted the correct colors. If the light was an all-round light the entire styrofoam ball was painted the appropriate color. If the light had a particular arc-of-visibility the appropriate sector of the light was painted the correct color while the rest of the styrofoam ball was painted black. The lights were mounted on dowels slightly smaller than the holes drilled in the "hulls." The dowels were cut to the appropriate lengths so that when the dowels were placed in the "hull" holes, the lights were given their correct vertical spacing. Appendix E contains diagrams of the the model.

The application tool took the form of a game. The game had four components. A three foot square of black felt was mounted on a wall, easel, or blackboard using masking tape or magnetic clips. The black felt represented nighttime or restricted visibility conditions at sea. Three inch diameter circles of red, green, white, and yellow felt represented lights. A die was altered by placing self stick labels on each of the six sides of the die. Each label had either "bow," "stern," and "side" written on it.

Each "bow" label was placed on opposite sides of the die as where "stern" and "side". The last component was the "flash cards" from the Coast Guard Institute Navigation Rules course. The "flash cards" deck contained only lighting configurations applicable to Inland Waters. A "player" was to diagram a lighting configuration on the black felt. Each "player" would select a "flash card" at random looking only at the side of the card with written description of the vessel and applicable rule. The "player" would roll the die to determine what aspect of the vessel was to be shown. If the die showed "side", the "player" had a choice of port or starboard. Using the colored felt circles, the "player" placed the lighting configuration of the drawn card showing the aspect of the rolled die onto the black felt. If the "player" was in doubt of the correct configuration, the reverse of the "flash card" had the correct configuration. The remainder of the "players" attempted to interpret the lighting configuration after it was placed on the black felt. The class was encouraged to analyze the configuration in a sequential matter as laid out in the study guide. First determining the vessel's heading, then determining what the vessel was, and lastly determining if the vessel was under any special circumstances that required consideration.

A pretest was developed that accomplished the design's purposes. It measured the existence of the entry level behaviors and measured how much subject matter knowledge the trainee possessed prior to the instruction. The pretest was developed as a take home test. The target population was unable to assemble at one time and place to take a pretest. The pretest was 25 questions. The pretest consisted of fill-in the blank and multiple choice questions. All but one of the multiple choice questions showed an illustration representing a lighting configuration, colored circles on a black background. The illustration was followed by a question such as "What direction is this vessel heading?" or "What is this vessel doing?" The first fifteen questions of the pretest concerned the public education boating safety course. If a trainee did poorly in this section, the trainee was encouraged to re-read the Navigation Rules chapter of the boating safety course text and review the homework question. The last ten questions covered the material to be learned. The instructions clearly identified the purpose of those last ten questions. The pretest is in Appendix F.

A post test was developed to measure how much the trainee had learned. It consisted of 25 multiple choice questions. Some of the questions followed the pretest format. The rest asked the trainee to choose the answer that best described the illustration. The designer chose this 25 question format because it seemed an appropriate length and the 80 per cent passing score could easily be determined. The designer was an American Red Cross (ARC) CPR instructor. Their CPR written test was 25 questions. The designer developed the post test to follow their ARC CPR test scoring key template and used CPR test answer sheets with references to the CPR course deleted as the answer sheet and scoring key for the post test. The use of the CPR testing materials ensured a random pattern of responses and greatly aided in the speed of post test scoring. The post test is in Appendix G.

Learning Activity Review

The learning materials were reviewed by a subject matter expert who was also an instructor. The designer had the study guide, models, application tool, and tests reviewed by a Coast Guard Warrant Officer who was a former instructor at the Boatswain Mate's School at Coast Guard Reserve Training Center, Yorktown, VA. This Warrant Officer's areas of expertise as an instructor were navigation, aids to navigation, and navigation rules. The warrant Officer found the material sound from an instructional stand point as the material covered all the instructional objectives. The Warrant Officer particularly liked the design of the course. The Warrant Officer had learned lighting configurations via the pure memorization method and thought this project's method was easier for the student to grasp the information. The models and application game were viewed as extremely helpful to the learning process. The tests were found to be as realistic as possible in a paper-and-pencil test. A few technical errors were found such as an inadvertent reference to feet verses meters. One test question had multiple correct answers. These errors were quickly corrected.

The material was proofread by the designer and another person. The designer proofread the material a day or two after it had been written, giving the designer time to forget what exactly had been written. This enabled the designer to proof read what had been written, not what was supposed to have been written. The material was given a second proofreading by someone who had never seen the material to ensure it contained correct grammar, spelling, style, and punctuation.

Materials for Evaluation Produced

Only one copy of the models and application game were used for the project's implementation. There were no changes in these visual aids suggested during the review by the subject matter expert.

The study guide and tests were edited according to the subject matter expert's and proof reader's suggestions. These edited study guide and tests were reproduced in sufficient quantities to start the formative evaluation process.

Another set of materials was developed for the project. Two reaction questionnaires were developed to measure the effectiveness of the instructor and the course. The first questionnaire was designed to be given the trainee at the end of the first class session and asked questions about the instructor's platform skills, responsiveness to trainee needs, and the physical classroom layout. The second questionnaire was intended for trainees to fill out at the end on the course and after taking the post test. This second questionnaire measured the trainees' reaction to the course overall. It asked questions such as what was useful and not useful, how was the pace of the course, how difficult was the course, and how was the quality of the visual aids and handout material. These questionnaires were developed following the suggestions of Phillips (1983) and reviewed by a co-worker of the designer familiar with the use of evaluation tools such as reaction questionnaires. These reaction questionnaires are in Appendix H.

Summary

The training materials and activities were the tangibles that the trainee received and experienced during the course. Great care must be exercised in their development. The materials and activities had to cover the whole subject matter. These tangibles and experiences had to neatly mesh together to form a cohesive learning package. There could be no holes or gaps that could cause the student to lose faith in the instruction. Every effort had to be made to eliminate errors that impacted upon credibility.

Excellent analysis and design could be wiped out with the development of inadequate materials and activities. The development of learning materials and activities had to completely cover the subject matter. The materials and activities had to smoothly flow from one to another. The materials and activities had to be as free from glitches as possible.

CHAPTER 5

IMPLEMENTATION

Introduction

Implementation was the phase which delivered the training and in which last minute fine tunings were made. These final adjustments further enhanced the credibility of the course. The project had passed the point where major content and instructional strategy changes were made. The designer checked such things as timing, clarity of instructions, and classroom mechanics. These were the items that a student would first encounter as flawed in the course and thus set the stage for an unsatisfactory learning experience.

Materials for Implementation Reproduced

Twenty copies of the pretest, post test, study guide, and each questionnaire were made. Copying these was a moderate undertaking as the pretest had 11 pages, the study guide 22 pages, and the post test 13 pages. The copying of these materials was problematic as the design of the course required the use of color in the media to enhance the realism of the course. The cost of color photocopying was prohibitive. One estimate the designer obtained was $2.50 per page. Even at a discount rate of $1.00 per page the cost of each post test would have been $13.00. The only reasonable remaining option was to hand color each test and study guide. The tests and study guides were reproduced in black and white format. Each diagram had white circles representing lights on black backgrounds.

Each test and study guide was hand colored using colored markers. Consideration was given to contracting the reproduction and coloring to a sheltered workshop for the handicapped. This plan was not implemented for this project as the amount of reproduction and lead time required by the workshop did not lend themselves to the implementation schedule. This reproduction plan would be reconsidered for future projects of this kind or future classes in this project.

The models and application game were not reproduced. There was no need for multiple copies of these as the course would not be offered simultaneously in two different venues. There was no difficulty in reproducing the reaction questionnaires as they did not require color.

Instructional Delivery

The instruction was delivered on the evenings of May 17 and May 24, 1990. Each evening covered one session and lasted aproximately two hours. A ten to fifteen minute break was given to the participants and instructor about half way into each session.

The designer was unable to find a sufficient number of people from the target population to conduct the course implementation. Four people from the target population were willing to commit themselves to attend two sessions on successive weeks for the course presentation. The designer found a group of people who closely approximated the target population. The designer solicited participants from a recently graduated Coast Guard Auxiliary boating safety public education course. Each person solicited was screened against the general target population criteria. Each was found to fit the criteria for the target population with one exception. That exception was that none were members of the Coast Guard Auxiliary. Each was a graduate of a Coast Guard Auxiliary boating safety public education course and eligible to join the Coast Guard Auxiliary. The designer believed that use of recent graduates of a Coast Guard Auxiliary boating safety course would not impact adversely on the implementation. The implementation participants could be considered members of the target population. The target population criteria was so broad due to the nature of the Coast Guard Auxiliary. In fact, most members of the Coast Guard Auxiliary were recruited from boating safety courses. Thirteen graduates expressed interest in the project and were given the pretest. Eleven graduates participated in the first session. Nine of those eleven graduates returned for the second session and took the post test.

Prior to the first class session, the pretest was adminstered to the participants as described in Chapter 4. All participants possessed the requried entry level knowledge.

The first session covered lessons one and two. The introduction started with a brief discussion concerning the importance of navigation lights using the USCGC Cuyahoga collision as an example of what could be the consequences of navigation light misintrepretation. The introduction continued with the distribution of course materials and explaination of how the course was to progress. Lesson one was presented using the guided discussion method augmented by the models. The participants joined in the discussion asking and answering questions. The models were used to illustrate the various lighting configurations and to show how a lighting configuration of a vessel changed as the aspect of the vessel changed from bow to side to stern. The session continued into lesson two using the same techniques as before. Lesson two continued after the break and the presentation of the subject matter finished with approximately twenty minutes left in the session. The application game was "played," as described in Chapter 4 for the next fifteen minutes. The session ended with the participants filling out the first reaction questionnaire.

The second class session started with a brief review of the previous sessions material. The instructor used the models to pose the particpants questions concerning which way a vessel was headed and in what activity the vessel was engaged. The instructor commenced the third lesson using the same techniques as the previous week. At the end of the subject matter presentation, the application game was "played." The post test was conducted after the break. As each participant completed the post test, the post test was scored on the spot by the instructor and participants given feedback on questions they missed. The end of course questionnaire was filled out after the participants received their post test scores.

Data Collection

The data collected came from four sources. The pretest, the post test, and the two reaction questionnaires were the instruments that collected the data in the course implementation.

Summary

Careful consideration was given to how this course was presented and how the presentation was de-bugged. If glitches occurred during the presentation, the effectiveness of the instruction was lessened. Preventing this type of damage was an important part of the overall picture.

Prior to implementation, the designer fought to eliminate errors by having a number of people review various parts of the course. These reviews concentrated on specific errors that the designer might overlook in the design and development of the course. The designer knew how the course was supposed to appear and function. These reviews made sure the course appeared and functioned as intended. The implementation allowed for some further fine tuning of the presentation.

CHAPTER 6

EVALUATION

Introduction

The evaluation phase determined the success or failure of the course as a whole and of each individual component within the course. Success of the components was a subjective measurement of the ability of the materials to teach. This was the formative evaluation. The evaluation phase indicated whether or not the course met its objectives. Did learning of the subject matter take place? This second part of the evaluation was the summative evaluation.

Formative Evaluation

The designer modified the formative evaluation procedures as outlined by Dick and Carey (1985). There was a general non-availability of target population members to conduct three separate four hour one-on-one presentations and one four hour small presentation. One-on-one and small group trials were held, but not as full presentations of the course. A formal field trial was not conducted, but some of the formative evaluation procedures were included in the course implementation.

One-On-One Trials

During these trials the written course material was reviewed. The designer sat down with an individual and asked the individual to review the pretest, study guide, and post test, in that order. The instructions to the participant was to read the material and critique the material for the following:

1. Clarity of instructions
2. Logical flow of material
3. Understanding of what the questions asked
4. Proofreading errors
5. Usefulness of diagrams
6. Any comments the participant wanted to make.

The designer observed and recorded the comments made by the participant. In the observation, the designer made note of the time needed to read each test. This was used as a rough estimate of how long it would take a trainee to take the test. The designer paid attention to the facial expressions of the reviewer. These facial expression observations could denote confusion or understanding of the material and were immediately followed up by questioning the reviewer about the material.

The designer found it difficult to obtain three members of the target population to conduct the one-on-one trials. The designer opted to include a non-member of the target population in these trails. The one exception was not a member of the Coast Guard Auxiliary, however the exception met all other target population criteria. Each participant was an adult, a boat owner, and not a novice in the field of boating, but not extremely experienced boater. In fact, one of the one-on-one trial participants did not boat at night because of a lack of confidence in that participant's ability to recognize the lighting configurations of other boats in restricted visibility conditions. All of the participants possessed the prerequisite knowledge.

The results of the one-on-one trials indicated a need for a second draft of the course materials. The study guide was expanded in size to include more room to take notes and further subdivide topics. Diagrams of vessels towed astern were included as well as vessels towed alongside and pushed ahead. The tests needed a couple of diagrams redrawn to add clarity. The distractors of the multiple choice questions needed more variation to prevent the student from determining the answer to a question, based on the answers of previous questions. Some test directions needed to be placed closer to their questions. The designer spent approximately one and one half hours on each one-on-one trial.

Small Group Trial

The small group trial participants were given the same instructions as the one-on-one trial participants. The three participants used met all the criteria of the target population. As in the one-on-one trials all were adults having the prerequisite knowledge. In this trial each was of a different educational background and work experience. One was a professional while the other two could be considered blue collar workers.

The results of the small group trial continued along the same lines of the one-on-one trials. The study guide was given an expanded introduction to explain what waters in the metropolitan New York City area were Inland Waters. A statement was added to the pretest instructions indicating that students should bring colored markers, pens, or pencils to the class to take notes. The time limit on the post test was expanded to one hour from the original 30 minutes because it was felt that just reading the test itself took too much of the original time limit.

Field Trial

There was no field trial held. The designer had an extremely difficult time finding members of the target population to conduct the one-on-one trials and the small group trials, not to mention the course implementation itself. After the input the designer received from the one-on-one and small group trials, the designer believed there would be little more gained from a field trial.

The models and application game had their first usage during the course implementation. So, in effect, the implementation was their only formative evaluation. The implementation indicated no need for substantial change in their design or construction. The models enabled the participant to see the "big picture" from the assembly of all the individual parts. The models showed how the lighting configuration maintained its significance as the mariner viewed the configuration from different aspects. The application game allowed the participants to utilize their newly gained knowledge in a realistic manner that was fun and challenging. The designer did underestimate the time needed to "play" the application game in the first class session. More time was devoted to the application game in the second class session.

Summative Evaluation

The summative evaluation asked the question, "Did it work?" This evaluation followed Kirkpatrick's (1987) model measuring reaction, learning, behavior, and results.

Reaction

This part of the summative evaluation measured how well the participants liked the training. Two questionnaires were developed as described in Chapter 5 to measure what the participants thought about the training. One questionnaire was aimed at how well the instructor was liked. The second questionnaire measured how well the participant enjoyed the course. The instructor questionnaire was patterned after the ASTD Institute Rating Chart. The course questionnaire was patterned after Phillips' New Supervisor's Development Program Evaluation Questionnaire (1983).

The results of both questionnaires were extremely positive. The participants liked the course, the models and application game in particular, and the instructor. All participants would recommend the course to others. Approximately one quarter of the participants suggested in the first reaction questionnaire that the instructor slow the pace of the delivery especially in the application game. The participants wanted the instructor to allow more time for participants to respond before the instructor gave guidance or hints about the diagrammed lighting configuration. In the second questionnaire, a third of the participants indicated a desire for more time be devoted to the application game. A compilation the reaction questionnaire results is in Appendix H. If "management" were to rate this course on only the reaction of the participants, the course would get an excellent rating.

Learning

This part of the evaluation measured whether or not learning took place. The proof of learning was a comparison of the pretest verses the post test results. As stated before, the pretest served double duty. The first part of the pretest measured the existence of the entry level knowledge. All members of the course implementation possessed that knowledge. The second part of the pretest measured prior knowledge of the subject matter. The subject matter portion of the pretest and the post test reflected the same weighting of test items covering the three general course tasks. Table 3 shows the results of that comparison.

From a very simplistic point of view one could claim that learning did take place as all scores, save one, increased from the pretest to the post test. The mean increased from 53.33 to 93.33 per cent. Further evidence that learning took place was that the standard deviation dropped dramatically from 26.25 to 6.53. This meant that all participants had relatively close post test scores. All participants in the implementation passed the post test.

From a statistical point of view one could, also, claim that learning did take place. Two calculations were conducted to statistically indicate learning took place, a one-tailed Correlated T-Test and a Chi-Square test.

A one-tailed Correlated T-Test was conducted using a 5 per cent level of significance and 8 degrees of freedom. The results of the training yielded a figure of 2.287 while the table showed a 1.869. The higher figure for the training over the table indicated that real learning did take place disproving a null hypothesis that there was no difference in knowledge of the participants before and after the training.

A Chi-Square Test was conducted to determine if the change in

Table 3

Pretest versus Post Test Results

Student	Pretest Score (%)	Post Test Score (%)	Gain
1	00	96	+96
2	40	100	+60
3	80	96	+16
4	30	96	+66
5	70	84	+14
6	80	80	00
7	40	96	+56
8	60	92	+32
9	80	100	+20
Mean	53.33	93.33	40.00
Standard Deviation	26.25	6.53	

scores was significant. Using the 80 per cent score as a passing grade, three of the nine passed the pretest, while all nine passed the post test. The Chi-Square table with a 2.5 per cent level of significance and one degree of freedom, one either passed or failed the test, showed a figure of 5.023. The calculation from the pretest and post test results yielded a figure of 6.248. This meant that there was a significant change in the scores of the participants at the 2.5 per cent level of significance.

A further analysis of the pretest and post test was done. The test results were reviewed for the number of participants missing particular questions. In the post test four of nine participants did not identify a vessel less than 50 meters in length as aground. This meant that either the question may be faulty, the instructional design may be faulty, or the instruction may be faulty. In future presentations of this course, that post test question will need to be watched for a similar reoccurrence. Only one other post test question was missed by more than one participant and only two missed that question. This occurence was not considered significant.

Behavior

The designer did not attempt to measure a behavior change. Kirkpatrick (1960) stated that one of the components needed to evaluate training in terms of behavioral changes was that, "a systematic appraisal should be made of on-the-job performance on a before and after basis." The designer was not able to accomplish this.

An attempt could be made to measure behavior changes by the use of a post training follow-up interview centering in on specific questions such as:

1. Do you do more boating at night since you have taken the course?
2. Do you feel more confident in yourself to go out at night?

This follow up interview could be conducted near the end of the boating season in mid to late August.

Results

Although not attempted in this project, this training could be measured in terms of results. The results would be a reduction in the number of nighttime vessel collisions caused by misinterpretation of vessel lighting configurations before and after training. None of the nine participants had been involved in a nighttime vessel collision prior to the training. This could cause an "uninformed" management to question the need for the training altogether based merely upon results.

Efforts to measure results would have brought the concept of "separation of variables" into play. The designer could attempt to measure results by an increased number of hours of boating after dark as opposed to a reduction in nighttime collisions. However, would this have been a result of training or possibly the addition of a radar equipment to the boat or other factor? The designer did not attempt to evaluate this course based on results, because of the potential for false assumptions being the basis for the course's evaluation. Just because the jails are full does not mean that all the criminals are off the street.

Learning Transfer

In this project, the designer defined learning transfer as participants using classroom-gained knowledge on the water after the training. This fits the definition of transfer of training very closely, "... the effective application, by trainees to their jobs, of the knowledge and skills gained in training (Broad, 1990)."

The concept of learning transfer or transfer of training involved three levels of organizational involvement before, during, and after the training to ensure the use of that training. The levels of organization involved were management, the trainee, and the trainer. Not all facets of this concept were present in this project.

In this project, there was no management involvement, because there was no management level in this project's organization. In a traditional organization, management can play an important role in the learning transfer process such as participating in the selection of trainees and ensuring trainees are not interrupted by job concerns, while participating in training.

The trainee assisted in the transfer by completing the pretest, thus preparing for the course by getting into the proper frame of mind. Most trainees took an active role during the course by engaging in discussions and participating in the application game even when they were not the "player." After the course, the trainees could review their notes and assess their own performances after each voyage.

The trainer assisted the transfer process by properly following the ISD model in developing the training. During the training, the trainer could give the trainee regular feedback concerning their performance and emphasize the benefits of applying their new found knowledge. The trainer did not but could have maintained contact with the trainees after the course to assess the use of the knowledge and to provide support with learning transfer problems.

Summary

The formative evaluation ensured that the material used to conduct the training was as free of flaws as possible. The designer believed that the formative evaluation met that goal. The field trial showed no glitches and the course critiques indicated no problems with the materials, instructional strategies, or instructional activities. The summative evaluation showed that learning did take place and that learning was significant. This from both a statistical point of view and non-quantitative point of view.

The designer felt that the training was effective and that further class offerings should use the same materials, strategies, and activities. If subsequent classes indicated a desire for more class sessions and more time for exercises, the designer would give serious consideration to those considerations.

CHAPTER 7

SUMMARY AND RECOMMENDATIONS

Introduction

The long hard work has ended. Now, the designer had to determine what really occurred in this project. The project started out as an idea and over time was molded and shaped into something similar to the original idea, but with some significant differences. The metamorphosis of the project and lessons learned are reported here.

Methods and Procedures Used

The project followed the Joint Services Model of instructional systems design (Center for Educational Technology, 1976) for the analysis, design, and development phases. The project progressed smoothly through these phases. The implementation and evaluation phases more closely followed Dick and Carey (1985) and departures from the plan occurred in these phases.

The analysis phase looked at the job tasks and target population. In the job task analysis, the designer realized that covering the entire subject of the navigation rules was too massive an undertaking and narrowed the scope of the project to navigational lights. During the analysis, the organizational constraints were determined. These constraints helped determine the instructional methods and media. The target population analysis helped determine entry level behaviors and assisted in the selection of instructional strategies.

The design phase continued according to the model. Instructional objectives were written and the entry level behaviors were defined. The remaining instructional objectives were grouped and sequenced into manageable sized lessons. The method and media for the instruction were determined. Anderson's (1983) media selection process and Knowles' (1987) adult learning theory were key in this process. The design phase determined how learning was to be measured, and how the training itself was to be judged effective. How classroom-gained knowledge was to be brought back to the boating environment was decided in the design phase.

The development phase progressed as intended. All the materials for the course were written or constructed. These materials underwent a subject matter expert and an instructional soundness review.

The implementation phase produced a serious departure from the "game plan." The target population could not be gathered to implement the project. The designer chose to use a group of people closely approximating the target population for the implementation. The designer had to wait for the participants to graduate from the boating safety course they were taking to implement the project. This raised havoc with the planned project schedule. In all other aspects, the implementation was conducted as planned.

The evaluation phase departed from Dick and Carey (1985) in two areas. Both departures had to do with the nonavailability of the target population. The one-on-one and small group trials were not conducted as full course presentations. The designer sat down with the participants in these trials and over the course of one and a half to two hours, the written course materials were evaluated. A field trial was not held because not enough members of the target population could commit to one particular day and time to attend.

Conclusions

The training was successful. The Chi-square test did not indicate a significant change at the one per cent level of confidence. The calculated figure was 6.25 where the one percent figure from the Chi-square table was 6.63490. If one were to interpolate the Chi-square table for a value of 6.25 with one degree of freedom, the level of confidence would be 1.375 per cent! The results of the training were very close to being significant at the one per cent level of confidence based on a statistical calculation. The fact that all of the participants passed the post test, the rise in the mean score, and the dramatic drop in the standard deviation support this conclusion.

The lack of a field trial did not adversely impact the training. The reaction questionnaires did not indicate that the instructional materials or instructional strategies were significantly lacking. All participants passed the post test which supports this conclusion.

The use of non-target population personnel in the implementation did not adversely impact the summative evaluation of this project. The target population analysis indicated a rudimentary knowledge level of the navigation rules. The instructional subject matter of the project commenced where this indicated rudimentary knowledge level ended. The only advantage the implementation personnel might have had over the target population would be a more recent exposure to navigation rules training, so the entry level knowledge was fresher in the minds of the implementation personnel.

The selection of instructional method and media was extremely important in the success of the project. The use of a guided discussion augmented with models and an application game proved to be the selling point of the course according to the reaction questionnaires. The models and application game were especially effective. These were much more effective than slides or overhead transparencies would have been.

The use of highly sophisticated visual aids were not required for the student to learn the material. The models and application game were extremely simple in design and use. The models and application game were relatively inexpensive. The simplicity of the aids seemed to be their greatest asset supporting the old adage KISS - Keep It Simple, Stupid.

The formative evaluation was a vital step in the entire project. The designer believed that there was little to be gained from the formative evaluation and that this evaluation was a mere formality. The designer had taken great pains to cover all the bases and leave nothing out of the training. The formative evaluation did not bring about major changes in the instruction, but enough fine points were raised that greatly enhanced the project that the designer had to admit the effort was worthwhile. The instructional material was good, but the formative evaluation made it better.

A target population of volunteers was extremely difficult to work with because of their unpredictability. Volunteers did not behave as a group as one would expect. Commitments to schedules and deadlines were non-existent. An individual volunteer's priorities could change without warning and attending training could no longer be a priority. If a volunteer wanted to attend training, they would want to attend regardless of entry level knowledge requirements or previous knowledge of the subject matter. It made no difference how the individual scored on the pretest, they would want to attend training even if they passed the pretest.

Expanding the course to five hours and/or holding both class sessions within the same week may be beneficial. The reaction questionnaires seem to support this contention and the instructor underestimated how long it takes to play the application game.

Recommendations

1. In future presentations of this course to the target population, the pretest should be deleted. Those who want to attend the training will want to regardless of a passing score on the pretest. A passing score will have no effect in their desire to attend training.

2. A field trial should be conducted expanding each class session to two and a half hours allowing more time for the application game.

3. A field trial should be conducted presenting the two class sessions within the same week allowing less time between classes to

forget subject matter.

4. A field trial should be conducted expanding each class session to two and a half hours and presenting both class sessions within the same week for the same reasons as 2 and 3 above.

Concluding Statement

I do not wish to belabor this conclusion. Those of you who have read this understand that the ISD process is a nearly fool-proof method of producing quality instruction. This process is time consuming and labor intensive, but can we live with the results of inadequate training?

I wish you to leave you with two thoughts. Do not be afraid to "Do Something Different" in your training. Be creative and original in your approach to training. Dare to be different! Your training message will get across. Remember your students and their needs. I do not remember who said this, but it works for me when I think of training:

"Tell me and I'll forget
Show me and I'll remember
Involve me and I'll understand"

APPENDIX A

JOB TASK ANALYSIS

- 1.0.0. Determine a vessel's heading
  - 1.1.0. Determine a vessel's heading from its sidelights
    - 1.1.1. Define sidelight
  - 1.2.0. Determine a vessel's heading from its masthead lights
    - 1.2.1. Define masthead light
    - 1.2.2. Define after masthead light
  - 1.3.0. Determine a vessel's heading from its stern light
    - 1.3.1. Define stern light
- 2.0.0. Determine type of vessel or its activity
  - 2.1.0. Describe the lights of a power driven vessel less than 50 meters in length and underway
    - 2.1.1. Define vessel
    - 2.1.2. Define power driven vessel
    - 2.1.3. Define underway
  - 2.2.0. Describe the lights of a power driven vessel less than 12 meters in length using optional all-round light and underway
    - 2.2.1. Define all-round light
  - 2.3.0. Describe the lights of a power driven vessel of 50 meters or more in length and underway
  - 2.4.0. Describe the lights of an air cushion vehicle in non-displacement mode
    - 2.4.1. Define non-displacement mode
    - 2.4.2. Define flashing light
  - 2.5.0. Describe the lights of a submarine running surfaced
    - 2.5.1. Define submarine

- 2.6.0. Describe the lights of a vessel engaged in law enforcement duties
  - 2.6.1. Define law enforcement duties
- 2.7.0. Describe the lights of a power driven vessel towing astern with a tow less than 200 meters in length
  - 2.5.1. Define towing light
- 2.8.0. Describe the lights of a power driven vessel towing astern with a tow 200 meters or greater in length
- 2.9.0. Describe the lights of a vessel towed astern
- 2.10.0. Describe the lights of a power driven vessel towing alongside or pushing ahead
  - 2.10.1. Define towing alongside
  - 2.10.2. Define pushing ahead
  - 2.10.3. Define composite unit
- 2.11.0. Describe the lights of a pushed vessel
  - 2.11.1. Define special flashing light
- 2.12.0. Describe the lights of a vessel towed alongside
- 2.13.0. Describe the lights of an inconspicuous or partially submerged object
- 2.14.0. Describe the lights of a sailing vessel
  - 2.14.1. Define sailing vessel
  - 2.14.2. Describe the combination light option for a sailing vessel
  - 2.14.3. Describe the red over green lights option for a sailing vessel
  - 2.14.4. Describe the lighting option for a sailing vessel less than 12 meters in length

2.15.0. Describe the lights for a vessel under oars
    2.15.1. Define under oars

2.16.0. Describe the lights of a fishing vessel underway and making way
    2.16.1. Define engaged in fishing
    2.16.2. Define making way

2.17.0. Describe the lights of a fishing vessel underway and not making way
    2.17.1. Define not making way

2.18.0. Describe the lights of a fishing vessel with gear extending 150 meters from the vessel

2.19.0. Describe the lights of a vessel engaged in trawling underway and making way
    2.19.1. Define engaged in trawling

2.20.0. Describe the lights of a vessel engaged in trawling underway and not making way

2.21.0. Describe the lights of a vessel engaged in minesweeping
    2.21.1. Define engaged in minesweeping

2.22.0. Describe the lights of a vessel engaged in pilotage duty
    2.22.1. Define engaged in pilotage duty

3.0.0. Determine whether the vessel is under any special circumstance that you need to be aware of and may require you to take action

3.1.0. Describe the lights of a vessel making way and not under command

  - 3.1.1. Define vessel not under command
- 3.2.0. Describe the lights of a vessel not making way and not under command
- 3.3.0. Describe the lights of a vessel restricted in her ability to maneuver
  - 3.3.1. Define vessel restricted in her ability to maneuver
- 3.4.0. List five situations where a vessel is restricted in her ability to maneuver
- 3.5.0. Describe the lights of a vessel less than 50 meters in length anchored.
  - 3.5.1. Define anchored
- 3.6.0. Describe the lights of a vessel 50 meters or greater in length anchored
- 3.7.0. Describe the lights of a vessel less than 50 meters in length aground
  - 3.7.1. Define aground
- 3.8.0. Describe the lights of a vessel 50 meters or greater in length aground

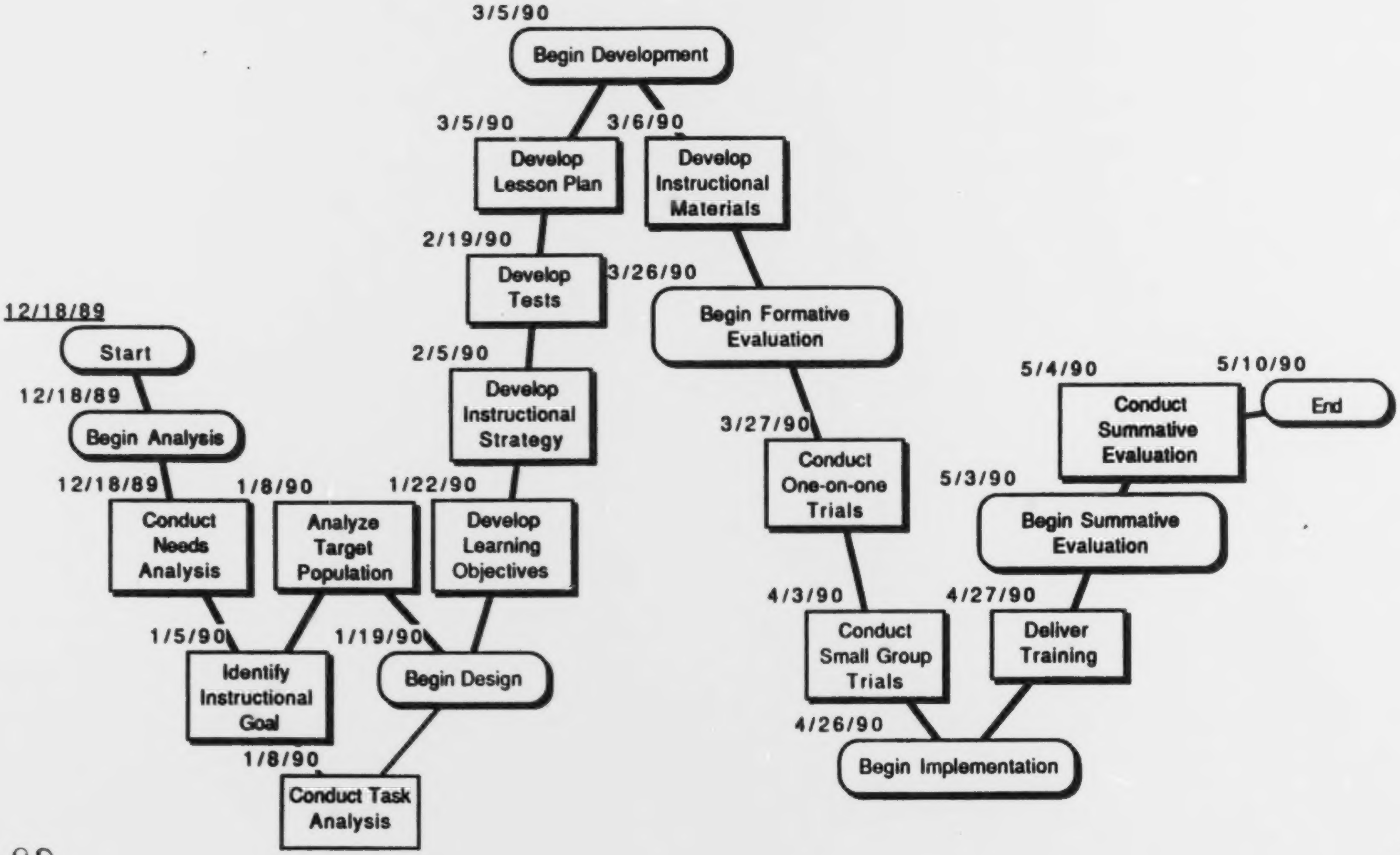
APPENDIX B

PROJECT PLANNING

PERT Diagram

100	Start	12/18/89
110 - 120	Begin Analysis	0 weeks
120 - 130	Conduct Needs Analysis	3 weeks
130 - 140	Identify Instructional Goal	1 week
140 - 150	Conduct Task Analysis	1 week
140 - 160	Analyze Target Population	2 weeks
150 - 170	Begin Design	0 weeks
160 - 170	Dummy Activity	
170 - 180	Develop Learning Objectives	2 weeks
180 - 190	Develop Instructional Strategy	2 weeks
190 - 200	Develop Tests	2 weeks
200 - 210	Develop Lesson Plan	1 week
210 - 220	Begin Delopment	0 weeks
220 - 230	Develop Instructional Materials	3 weeks
230 - 240	Begin Formative Evaluation	0 weeks
240 - 250	Conduct One-on-One Trials	1 week
250 - 260	Conduct Small Group Trial	1 week
260 - 270	Begin Implementation	0 weeks
270 - 280	Deliver Training	1 week
280 - 290	Begin Summative Evaluation	0 weeks
290 - 300	Conduct Summativc Evaluation	1 week
300 - 310	End	

Night Lighting Configurations
Course Development Plan



12/18/89
Start

12/18/89
Begin Analysis

12/18/89
Conduct Needs Analysis

1/5/90
Identify Instructional Goal

1/8/90
Analyze Target Population

1/8/90
Conduct Task Analysis

1/19/90
Begin Design

1/22/90
Develop Learning Objectives

2/5/90
Develop Instructional Strategy

2/19/90
Develop Tests

3/5/90
Develop Lesson Plan

3/5/90
Begin Development

3/6/90
Develop Instructional Materials

3/26/90
Begin Formative Evaluation

3/27/90
Conduct One-on-one Trials

4/3/90
Conduct Small Group Trials

4/26/90
Begin Implementation

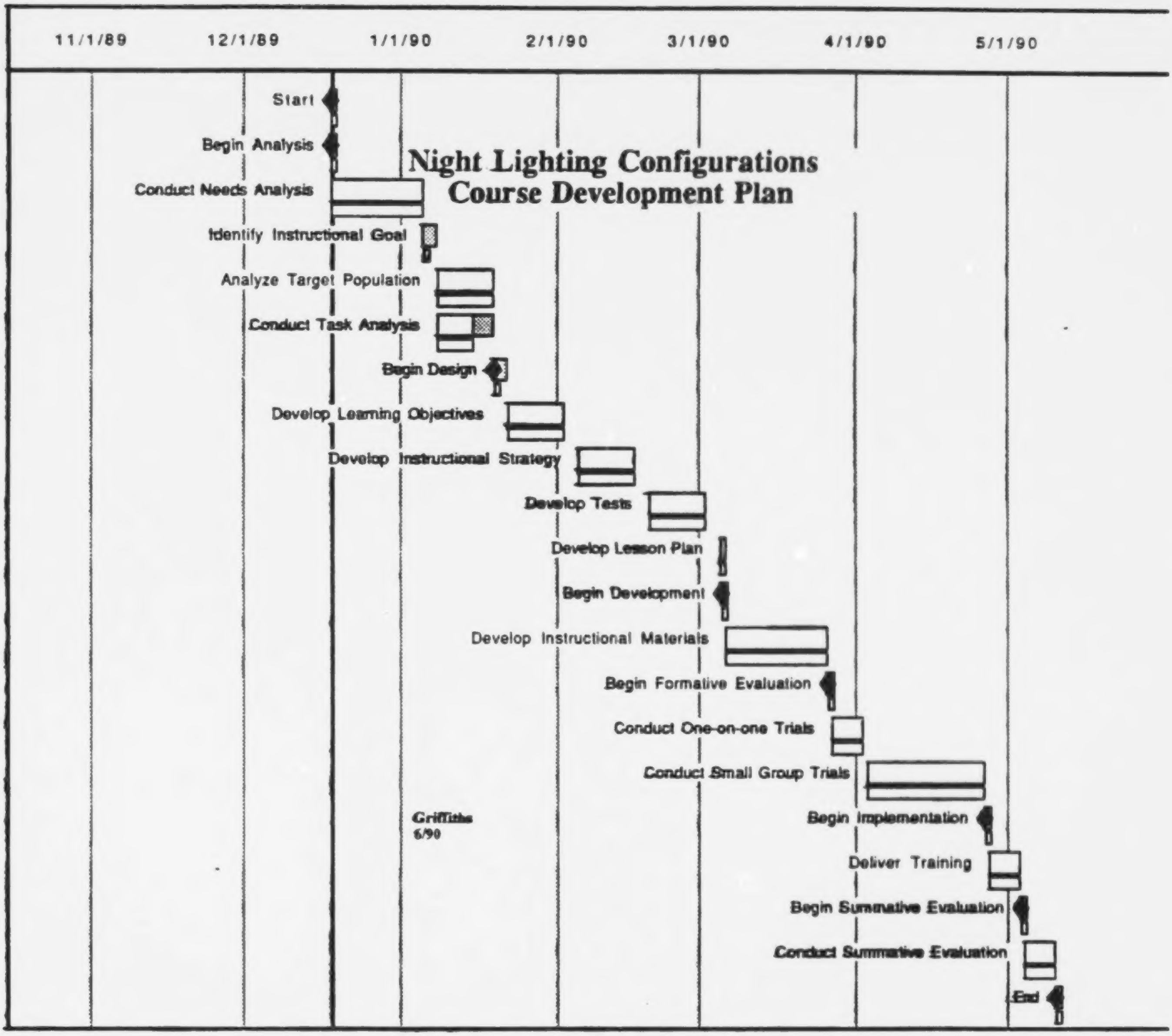
4/27/90
Deliver Training

5/3/90
Begin Summative Evaluation

5/4/90
Conduct Summative Evaluation

5/10/90
End

G.Griffiths
10/89



Night Lighting Configurations
Course Development Plan

APPENDIX C

INSTRUCTIONAL OBJECTIVES

1.0.0. Given an approaching vessel's lighting configuration and without references, student will determine vessel's heading. Determination must state whether the approaching vessel is crossing from right to left or left to right, meeting, or being overtaken.

1.1.0. Given an approaching vessel's lighting configuration with side lights visible and without references, student will determine vessel's heading. Determination must state whether the approaching vessel is crossing from right to left or left to right, meeting, or being overtaken.

1.1.1. Without references, student will define side lights. Definition must be in accordance with (IAW) the Inland Navigation Rules Act of 1980 (INRA) Rule 21b.

1.2.0. Given an approaching vessel's lighting configuration with masthead lights but no side lights visible and without references student will determine the approaching vessel's heading. Determination must state whether the approaching vessel is crossing from right to left or left to right, meeting, or being overtaken.

1.2.1. Without references, student will define masthead lights. Definition must be IAW INRA Rule 21a.

1.2.2. Without references, student will define after masthead lights. Definition must be IAW INRA Rule 23a(ii).

1.3.0. Given an approaching vessel's lighting configuration with only its stern lights visible and without references, student will determine the approaching vessel's heading.

Determination must state whether the approaching vessel is crossing from right to left or left to right, meeting, or being overtaken.

1.3.1. Without references, student will define stern lights. Definition must be IAW INRA Rule 21c.

2.0.0. Given an approaching vessel's lighting configuration and without references, student will identify the approaching vessel's type. Identification must be power driven vessel, sailing vessel, towing vessel, towed vessel, fishing vessel, trawling vessel, minesweeper, or pilot vessel.

2.1.0. Without references, student will describe the lights of a power driven vessel less than 50 meters in length and underway. Description must be IAW INRA Rule 23a.

2.1.1. Without references, student will define vessel. Definition must be IAW INRA Rule 3.

2.1.2. Without references, student will define power driven vessel. Definition must be IAW INRA Rule 3.

2.1.3. Without references, student will define underway. Definition must be IAW INRA Rule 3.

2.2.0. Without references, student will describe the lights of a power driven vessel less than 12 meters in length using optional all-round light and underway. Description must be IAW INRA Rule 23c.

2.2.1. Without references, student will define all-round light. Definition must be IAW INRA Rule 21e.

2.3.0. Without references, student will describe the lights of a power driven vessel 50 meters or more in length.

Description must be IAW INRA Rule 23.

2.4.0. Without references, student will describe the lights of an air cushion vehicle in non-displacement mode. Description must be IAW INRA Rule 23b.

2.4.1. Without references, student will define non-displacement mode. Definition must be IAW INRA Rule 23b.

2.4.2. Without references, student will define flashing light. Definition must be IAW INRA Rule 21f.

2.5.0. Without references, student will describe the lights of a power driven vessel towing astern with a tow 200 meters or less in length. Description must be IAW INRA Rule 24a.

2.5.1. Without references, student will define towing light. Definition must be IAW INRA Rule 21d.

2.6.0. Without references, student will describe the lights of a power driven vessel towing astern with a tow greater that 200 meters in length. Description must be IAW INRA Rule 24a.

2.7.0. Without references, student will describe the lights of a vessel towed astern. Description must be IAW INRA Rule 24e.

2.8.0. Without references, student will describe the lights of a power driven vessel towing alongside or pushing ahead. Description must be IAW INRA Rule 24c.

2.8.1. Without references, student will define towing alongside. Definition must be IAW INRA Rule 24.

2.8.2. Without references, student will define pushing ahead. Definition must be IAW INRA Rule 24.

2.8.3. Without references, student will define composite unit. Definition must be IAW INRA Rule 24b.

2.9.0. Without references, student will describe the lights of a pushed vessel. Description must be IAW INRA Rule 24f(i).

2.9.1. Without references, student will define special flashing light. Definition must be IAW INRA Rule 21g.

2.10.0. Without references, student will describe the lights of a vessel towed alongside. Description must be IAW INRA Rule 24f(ii).

2.11.0. Without references, student will describe the lights of an inconspicuous vessel or partially submerged object. Description must be IAW INRA Rule 24g.

2.12.0. Without references, student will describe the lights of a sailing vessel. Description must be IAW INRA Rule 25a.

2.12.1. Without references, student will define sailing vessel. Definition must be IAW INRA Rule 3.

2.12.2. Without references, student will describe the combination light option for a sailing vessel. Description must be IAW INRA Rule 25b.

2.12.3. Without references, student will describe the red over green option for a sailing vessel. Description must be IAW INRA Rule 25c.

2.12.4. Without references, student will describe the lighting option for a sailing vessel less than 12 meters in length. Description must be IAW INRA Rule 25d(i).

2.13.0. Without references, student will describe the lights of a vessel under oars. Description must be IAW INRA Rule

25d(ii).

2.14.0. Without references, student will describe the lights of a fishing vessel making way. Description must be IAW INRA Rule 26c.

2.14.1. Without references, student will define vessel engaged in fishing. Definition must be IAW INRA Rule 3d.

2.14.2. Without references, student will define making way. Definition must be IAW INRA Rule 26c(iii).

2.15.0. Without references, student will describe the lights of a fishing vessel not making way. Description must be IAW INRA Rule 26c.

2.16.0. Without references, student will describe the lights of a fishing vessel with gear extending 150 meters from the vessel. Description must be IAW INRA Rule 26c(ii).

2.17.0. Without references, student will describe the lights of a vessel engaged in trawling making way. Description must be IAW INRA Rule 26b.

2.17.1. Without references, student will define trawling. Definition must be IAW INRA Rule 26b.

2.18.0. Without references, student will describe the lights of a vessel engaged in trawling not making way. Description must be IAW INRA Rule 26b.

2.19.0. Without references, student will describe the lights of a vessel engaged in minesweeping. Description must be IAW INRA Rule 27f.

2.19.0. Without references, student will define minesweeping. Definition must be IAW INRA Rule 27f.

2.20.0. Without references, student will describe the lights of a vessel engaged in pilotage duty. Description must be IAW INRA Rule 29.

2.20.1. Without references, student will define engaged in pilotage duty. Definition must be IAW the International Maritime Dictionary.

2.21.0. Without references, student will describe the lights of a submarine running surfaced. Description must be IAW 32 CFR 707.

2.21.1. Without references, student will define submarine. Definition must be IAW the International Maritime Dictionary.

3.0.0. Without references, student will identify vessels with a condition that requires special consideration. Identification must be of vessels unable to maneuver IAW INRA Rules 27 and 30.

3.1.0. Without references, student will describe the lights of a vessel making way but not under command. Description must be IAW INRA Rule 27a.

3.1.1. Without references, student will define vessel not under command. Definition must be IAW INRA Rule 3f.

3.2.0. Without references, student will describe the lights of a vessel not making way and not under command. Description must be IAW INRA Rule 27a.

3.3.0. Without references, student will describe the lights of a vessel restricted in her ability to maneuver. Description must be IAW INRA Rule 27b.

3.3.1. Without references, student will define vessel restricted in her ability to maneuver. Definition must be IAW INRA Rule 3g.

3.4.0. Without references, student will list five situations where a vessel is restricted in her ability to maneuver. List must be IAW INRA Rule 3g.

3.5.0. Without references, student will describe the lights of a vessel less than 50 meters in length anchored. Description must be IAW INRA Rule 30b.

3.5.1. Without references, student will define anchored. Definition must be IAW INRA Rule 30.

3.6.0. Without references, student will describe the lights of a vessel 50 meters or greater in length anchored. Description must be IAW INRA Rule 30a.

3.7.0. Without references, student will describe the lights of a vessel less than 50 meters in length aground. Description must be IAW INRA Rule 30d.

3.7.1. Without references, student will define aground. Definition must be IAW INRA Rule 30.

3.8.0. Without references, student will describe the lights of a vessel 50 meters or greater in length aground. Description must be IAW INRA Rule 30d.

APPENDIX D

STUDENT STUDY GUIDE

NAVIGATION RULES
LIGHTING CONFIGURATIONS
STUDENT STUDY GUIDE

INTRODUCTION

Don't worry! The diagram on the front cover of this student study guide represents the lighting configuration of a vessel you could encounter. I know it looks like just a bunch of lights with no particular meaning, but those lights are giving you a great deal of information about that vessel.

What this course will show you is how to recognize and interpret the lights of vessels on Inland waters, such as Long Island Sound or the East River, at night. You will learn to:

1. Determine the direction the vessel is traveling.
2. Determine what the vessel is doing, eg. fishing, towing, etc.
3. Determine whether that vessel is under any special circumstance you need to be aware of, such as aground, unable to maneuver, etc.

What is so important about learning this material? Why should I want to learn all this stuff? What good will it do me? This course will help you:

1. Avoid collisions.
2. Gain more confidence in yourself.
3. Become a better boater.

The approach this course will use to teach you all this material is simple and relatively painless. Each group of lights in a vessel's lighting configuration tells a chunk of the overall story. We will teach you all the chunks and then assemble all the chunks into the "big picture." We will make sure we account for every light we see.

When you signed up for this course, you took a test. You hadn't even taken a single class, yet you were being tested about the Navigation Rules. This course starts out where your U. S. Coast Guard Auxiliary boating safety course left off and this course assumes you remember all that Navigation Rules information. That test told the instructor whether or not a review of the Navigation Rules information was needed.

This study guide is set up for you to take notes. The blank spaces are provided to write those notes. Vessel diagrams are given without the lighting configurations. You can fill in those diagrams as we cover each vessel's lighting configuration. You may find it helpful to use colored pens, pencils, or markers to fill in the lighting configurations. If you do you will need the colors red, green, yellow, blue, and black. The instructor will ask you many questions that will, we hope, make you think. Those questions will help you learn the material. When you come upon the answer to a question feel free to write it in the space provided.

There will be a test at the end of the course. The test will contain 25 multiple choice questions. An 80% score is considered passing. So, you can miss five questions and pass. The test will cover the material presented. It is written in a similar manner to the test you took before the course. So, you have an idea of what to expect.

If you wish to further study the Navigation Rules, you can obtain a copy of Navigation Rules (COMDTINST M16672.2A) from your local Government Printing Office bookstore or from

Superintendent of Documents
U. S. Government Printing Office
Washington, D. C. 20402

LESSON 1

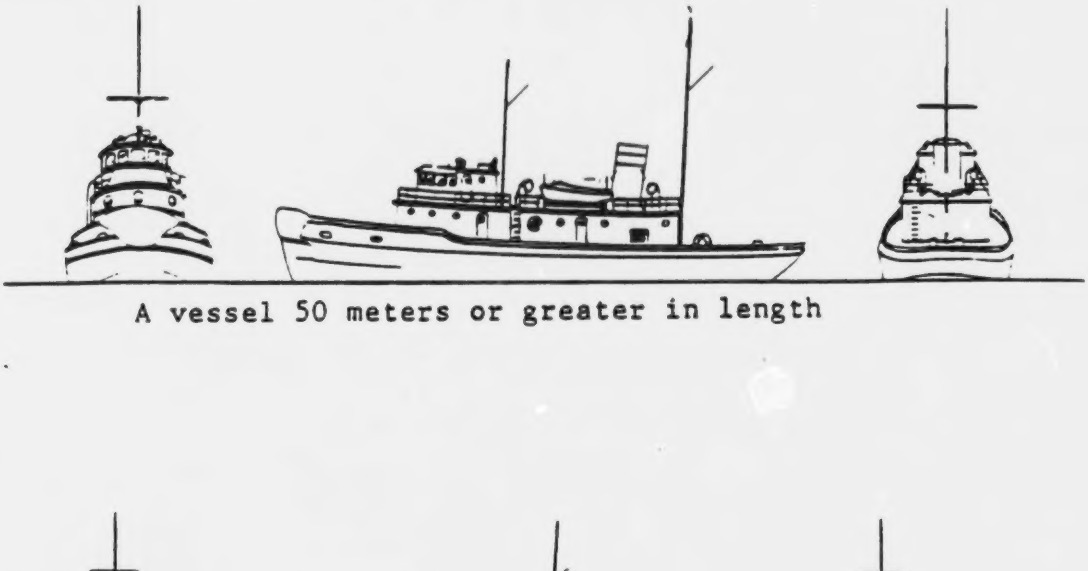
Which way did they go?

The purpose of this lesson is to determine a vessel's heading when you can't see its sidelights.

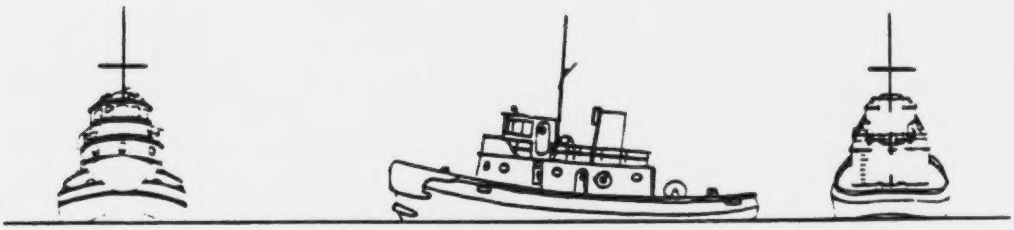
Why wouldn't you see a vessel's sidelights?

If a vessel is 50 meters or more in length it must show an after masthead light. Where is this after masthead light placed?

Can a vessel show an after masthead light if the vessel is less than 50 meters in length?



A vessel 50 meters or greater in length



A vessel less than 50 meters in length

So how do I tell a vessel's heading from its masthead lights?

Special cases

Air Cushion Vehicle

Pleasure craft less that 12 meters in length

Surfaced submarines

LESSON 2

Who are those guys?

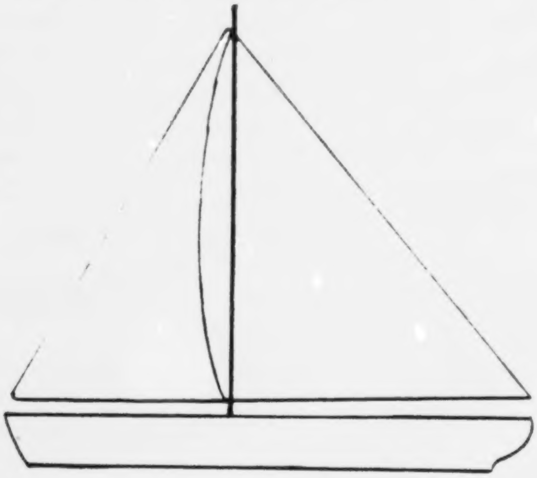
The purpose of this lesson is to determine what a vessel is or what the vessel is doing?

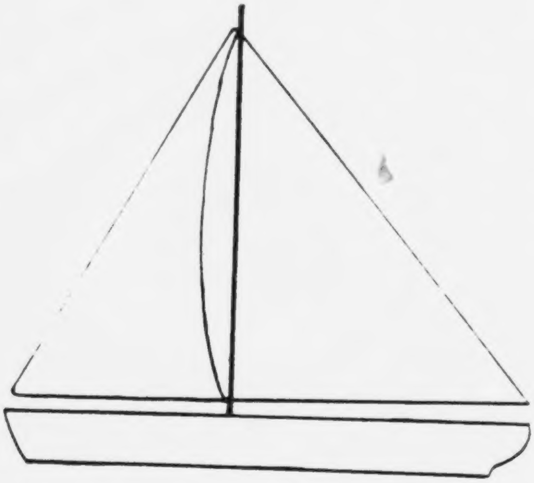
Generally a set of two lights replace the masthead light of a vessel. These lights can be identified using a rhyme.

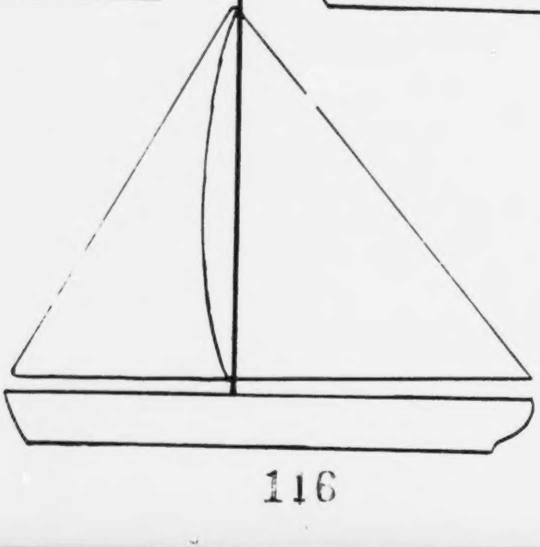
Red over Green, Sailing Machine

A sailboat can show a red over green all-round lights in a vertical line in addition to its side and stern lights.

What three lighting configurations can a sailboat underway under sail alone use?



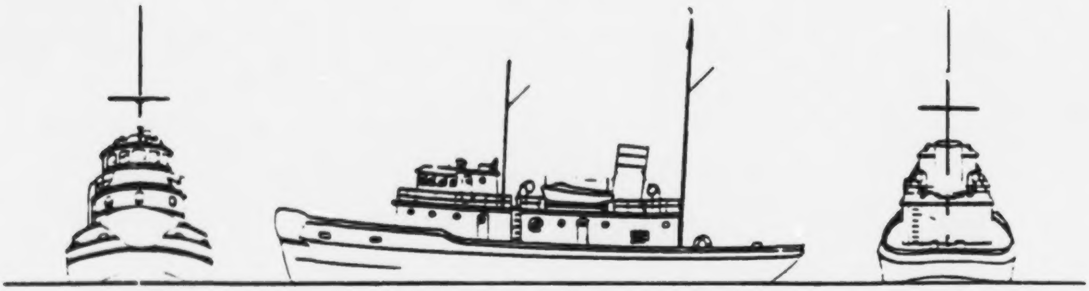




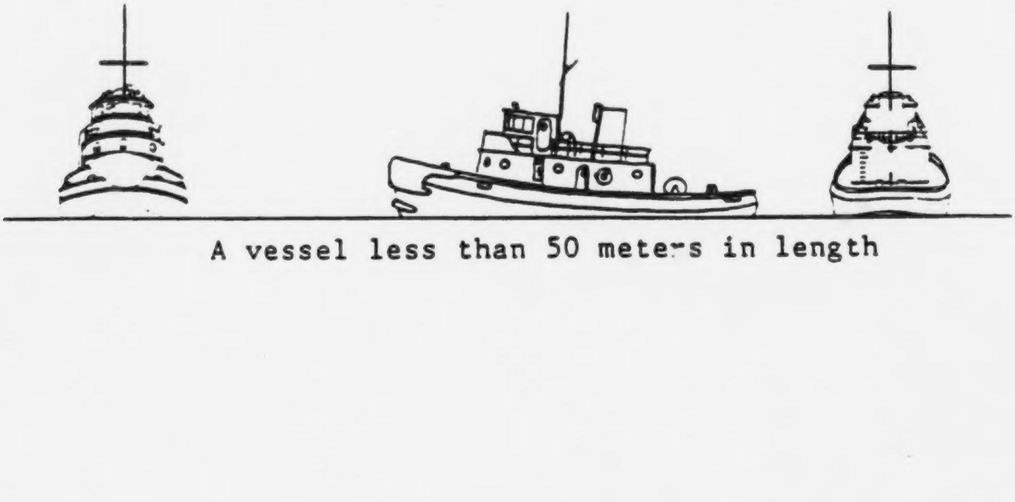
White over White, Towing at Night

A power driven vessel towing a vessel will have a second masthead light directly below its masthead light. If the tow is aft of the towing vessel and exceeds 200 meters a third light in a vertical line is added.

Vessel towing astern with tow of less than 200 meters

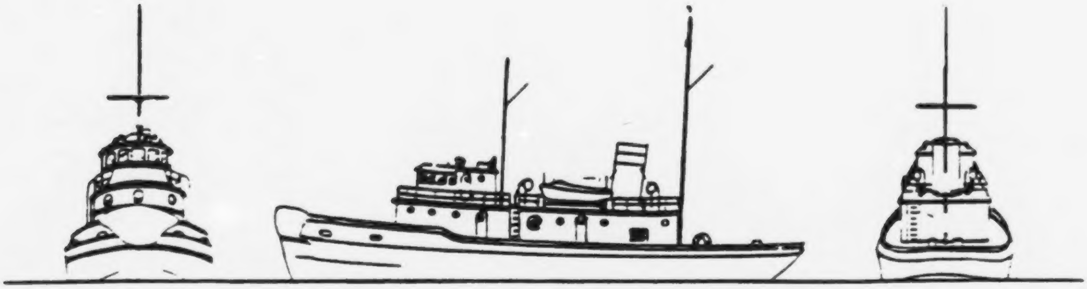


A vessel 50 meters or greater in length

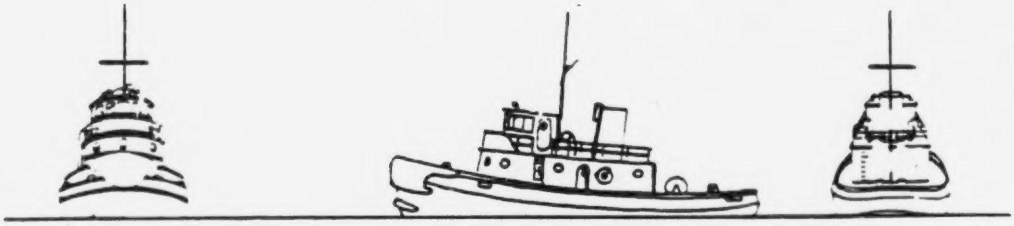


A vessel less than 50 meters in length

Vessel towing astern with tow of 200 meters or more



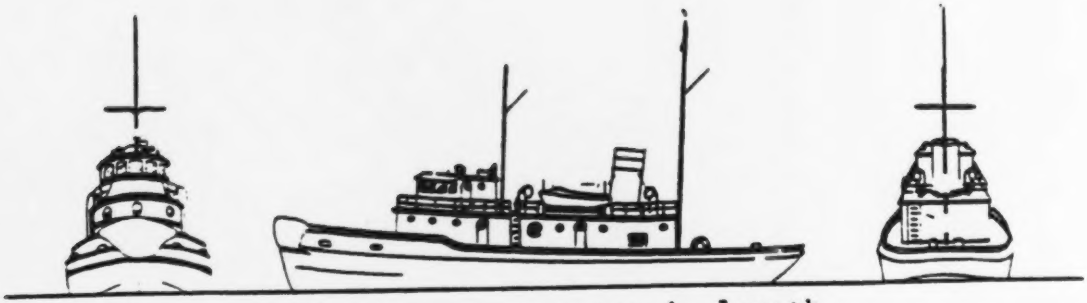
A vessel 50 meters or greater in length



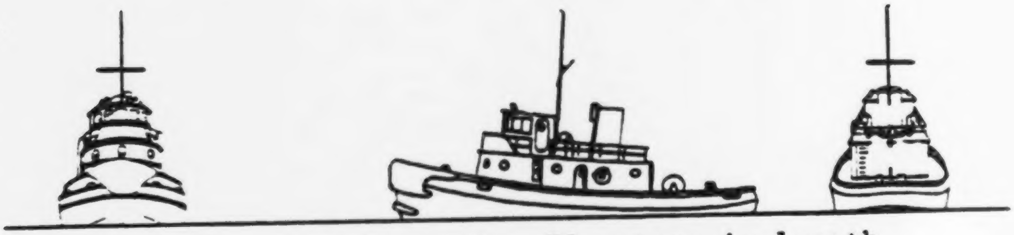
A vessel less than 50 meters in length

But how can I tell if a vessel is towing if I can't see the masthead light from astern of the towing vessel?

Are there any lighting differences if the vessel is towing alongside or pushing ahead?

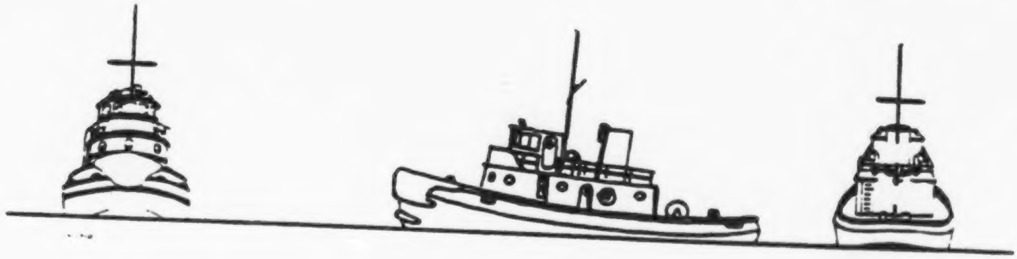


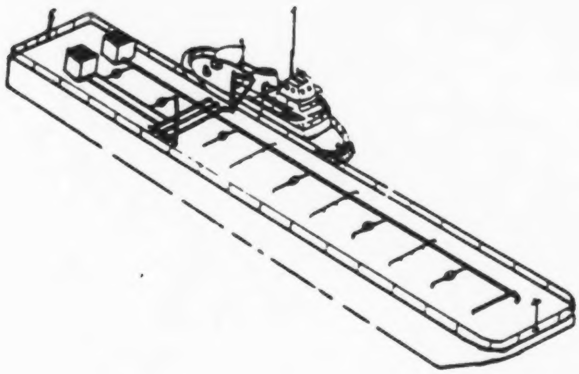
A vessel 50 meters or greater in length

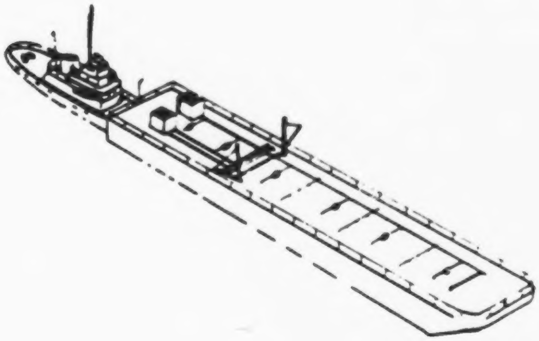


A vessel less than 50 meters in length

What about the towed vessel?





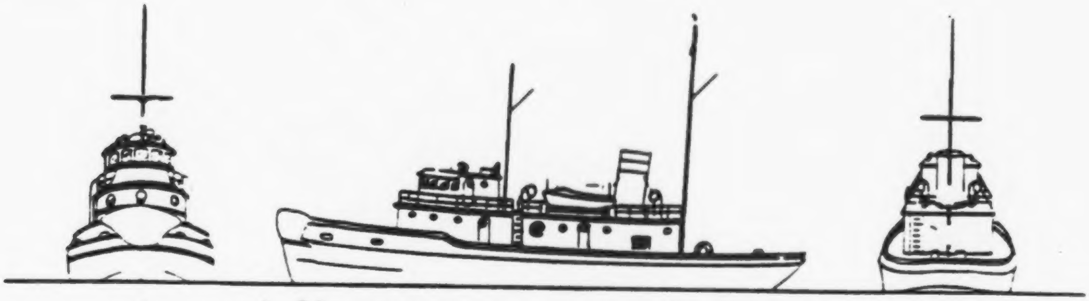


What's a composite unit and what does it look like?

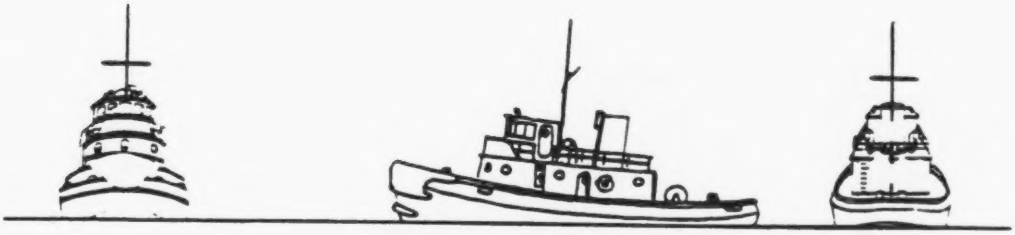
Red over White, We'll be Fishing all Night

A vessel engaged in fishing replaces its masthead light with two all-round lights in a vertical line, the upper red and the lower white.

If the fishing vessel is drifting or not making way only the red over white lights are shown. The side and stern lights are turned off.



A vessel 50 meters or greater in length



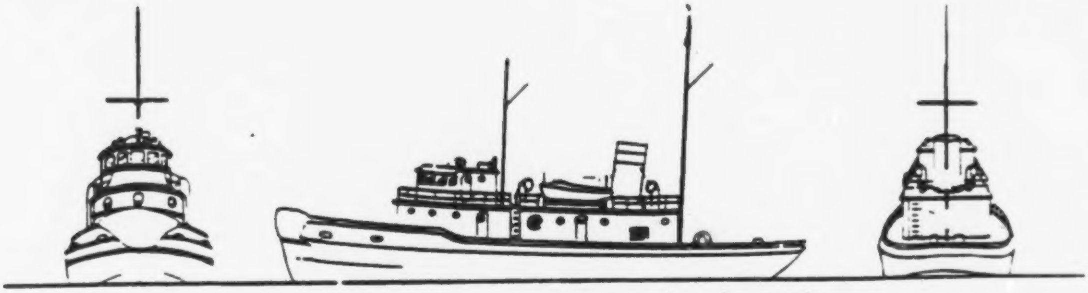
A vessel less than 50 meters in length

How does a fishing vessel warn other vessels about the direction its nets are tending?

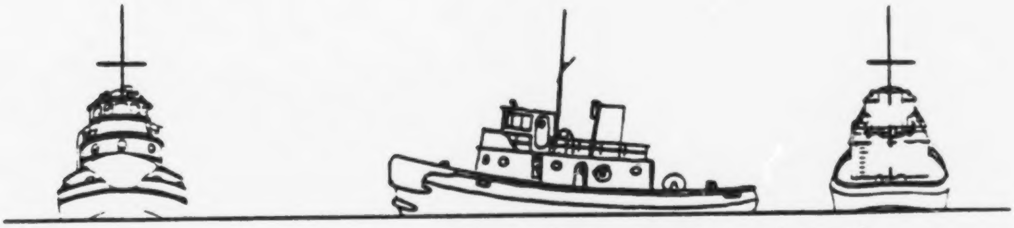
Green over White, Trawling at Night

A vessel engaged in trawling replaces its masthead light with two all-round lights in a vertical line, the upper green and the lower white.

If the trawling vessel is drifting or not making way only the green over white lights are shown. The side and stern lights are turned off.



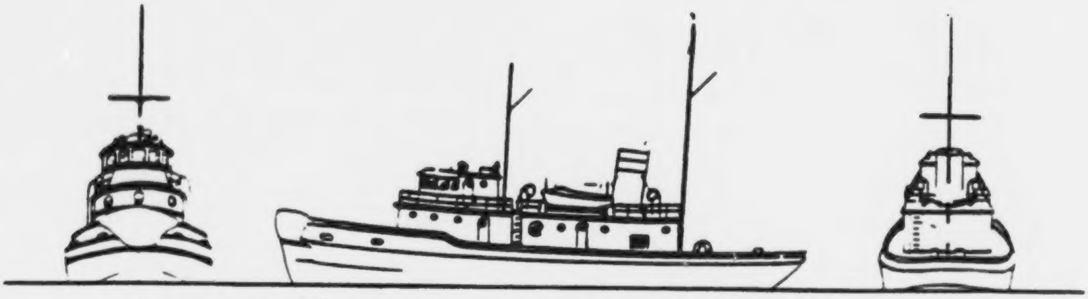
A vessel 50 meters or greater in length



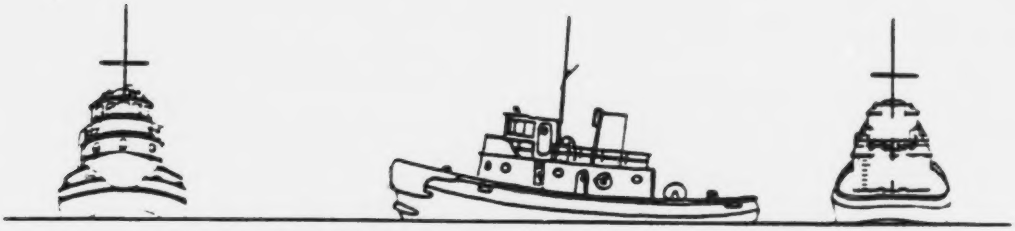
A vessel less than 50 meters in length

White over Red, Pilot Ahead

A vessel engaged in pilotage duty replaces its masthead light with two all-round lights in a vertical line, the upper white and the lower red.



A vessel 50 meters or greater in length



A vessel less than 50 meters in length

What lights does an anchored pilot boat show?

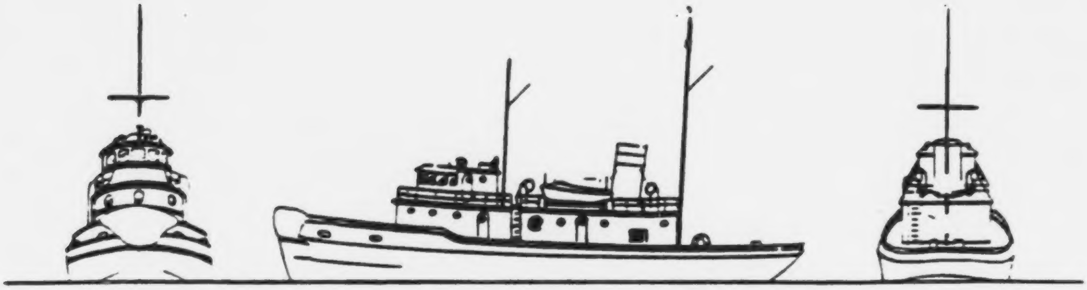
LESSON 3

Ready or not here I come!

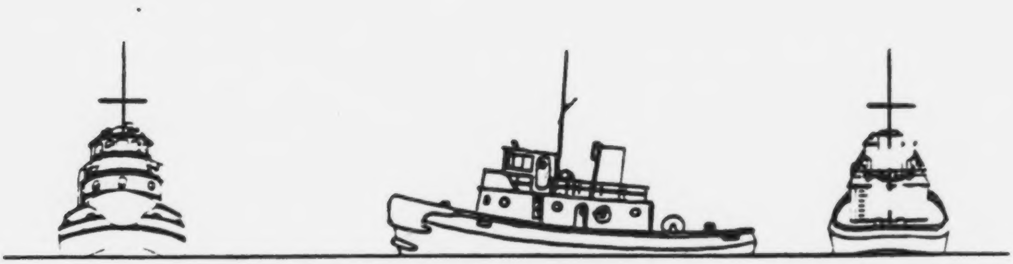
The purpose of this lesson is to show you how other vessels communicate that they are in a particular circumstance that requires special consideration from you. You may not be able to claim right of way.

Red over Red, Pilot is Dead

A vessel that is Not Under Command replaces its masthead light with two all-round lights in a vertical line, both red.

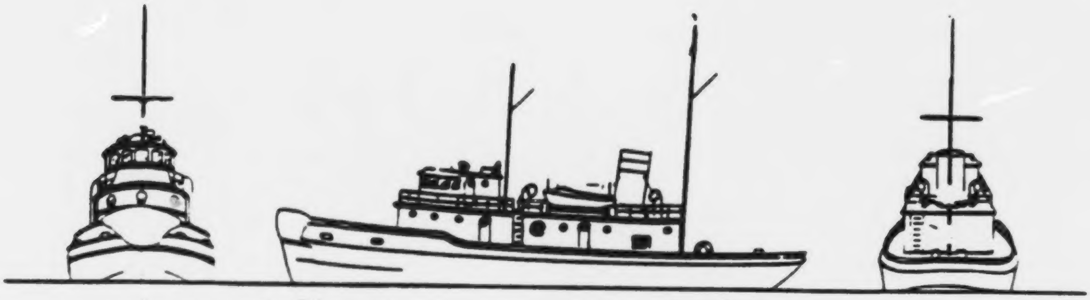


A vessel 50 meters or greater in length

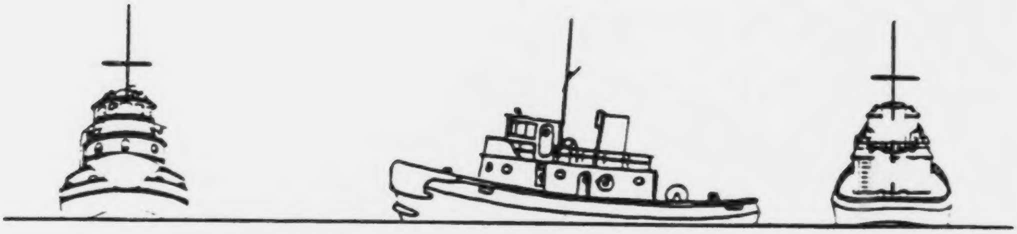


A vessel less than 50 meters in length

If the vessel Not Under Command is underway, not making way, the side and stern lights are turned off.



A vessel 50 meters or greater in length

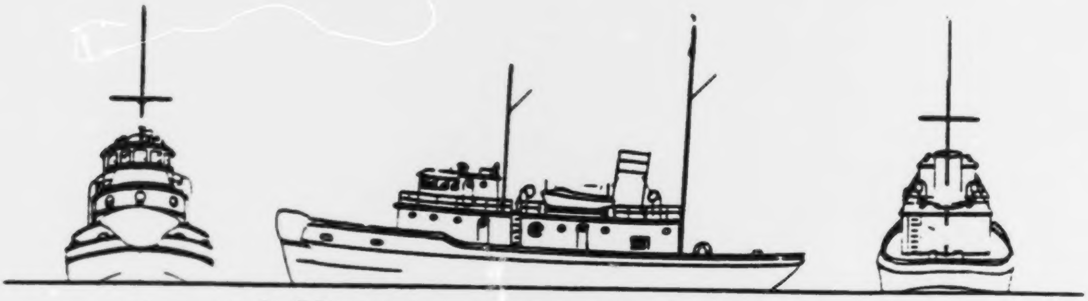


A vessel less than 50 meters in length

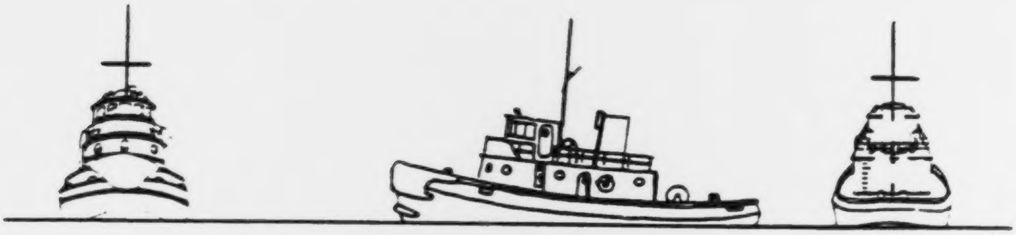
What makes a vessel Not Under Command?

Restricted in Her Ability to Maneuver

A vessel Restricted in Her Ability to Maneuver shows three all-round lights in a vertical line, the upper red, the middle white, and the lower red, in addition to her normal lights. These three lights are shown where best seen.



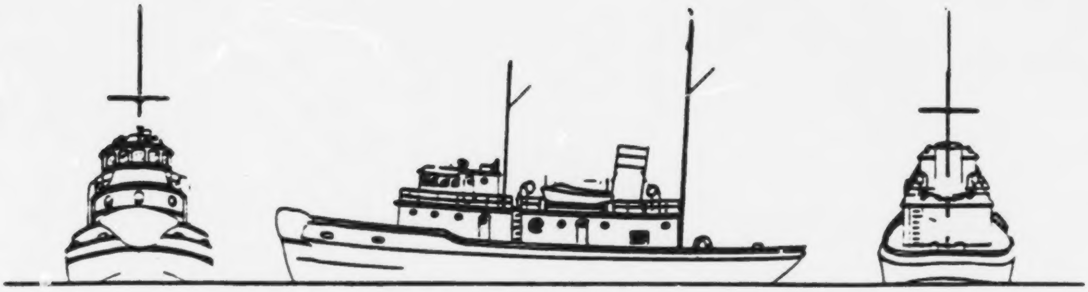
A vessel 50 meters or greater in length



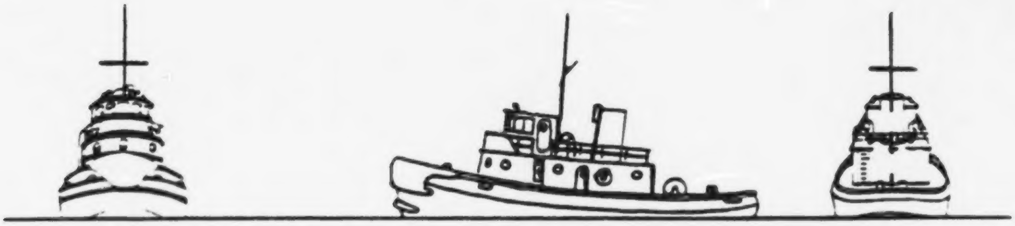
A vessel less than 50 meters in length

What makes a vessel Restricted in Her Ability to Maneuver?

How does a vessel Restricted in Her Ability to Maneuver tell you that it has an obstruction to one side and it is safe to pass on the other side? What kind of vessel would need to tell you that?



A vessel 50 meters or greater in length

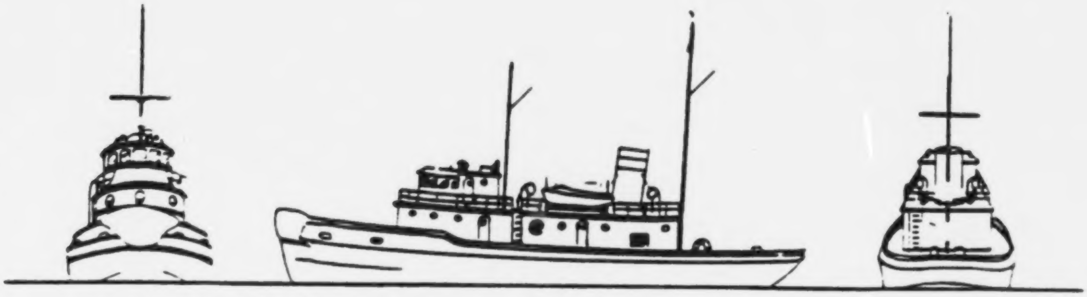


A vessel less than 50 meters in length

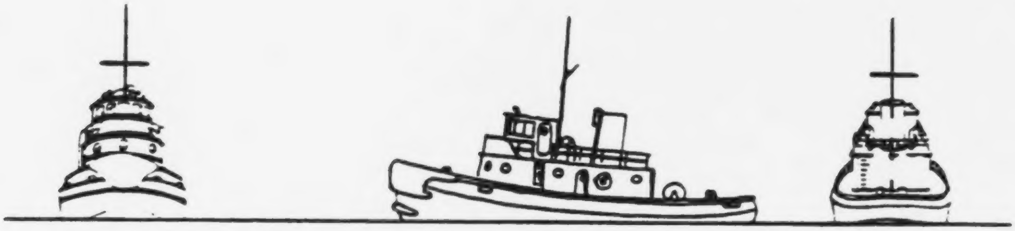
Minesweeping

A vessel engaged in minesweeping shows three all-round green lights in a triangle formation in addition to its normal lights. The green lights are placed one near the foremast head and one end of each fore yard.

It is not safe to be closer than 500 meters from the sides or 1000 meters astern of a minesweeper.



A vessel 50 meters or greater in length



A vessel less than 50 meters in length

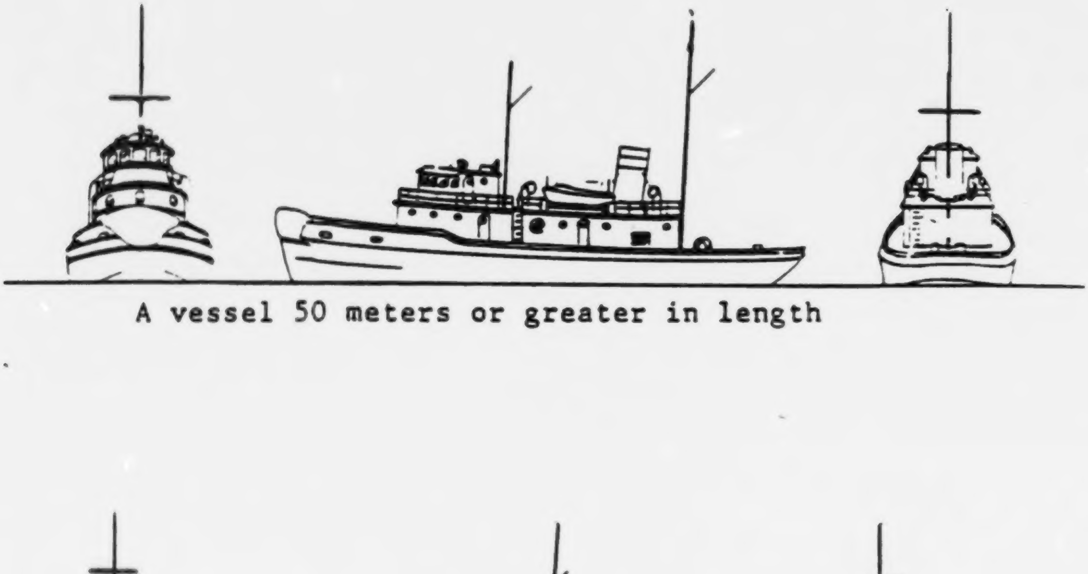
Anchored

A vessel anchored must show two white all-round lights where they can best be seen. One in the fore part of the vessel. The second at or near the stern at a lower level than the forward light.

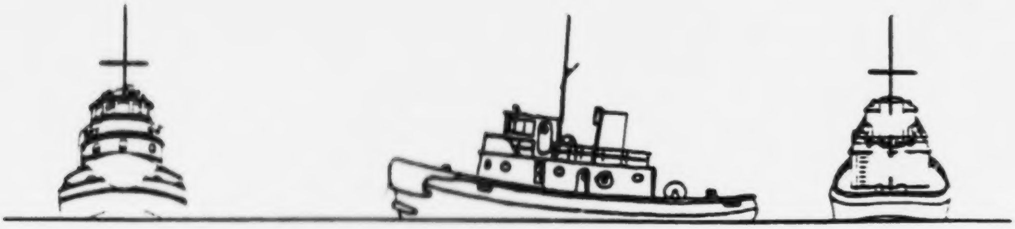
A vessel less than 50 meters in length **may** show one white all-round light where best seen.

If the vessel is 100 meters in length, it must display any deck lighting it has to further enhance its identification. A vessel less than 100 meters in length **may** show the additional deck lighting.

Do you always have to show anchor lights?



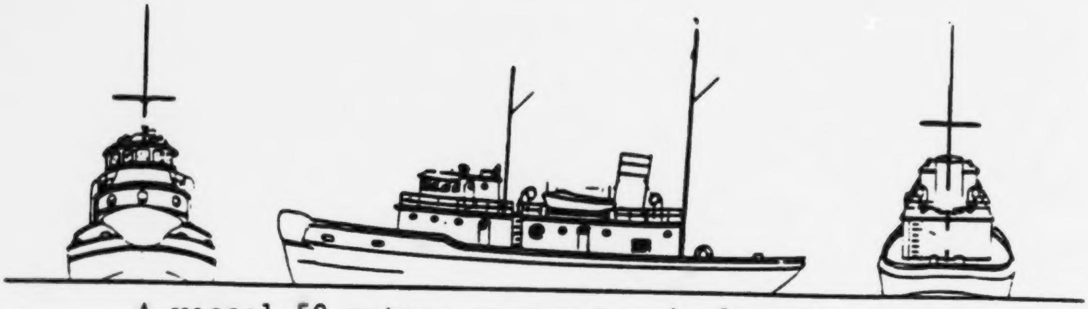
A vessel 50 meters or greater in length



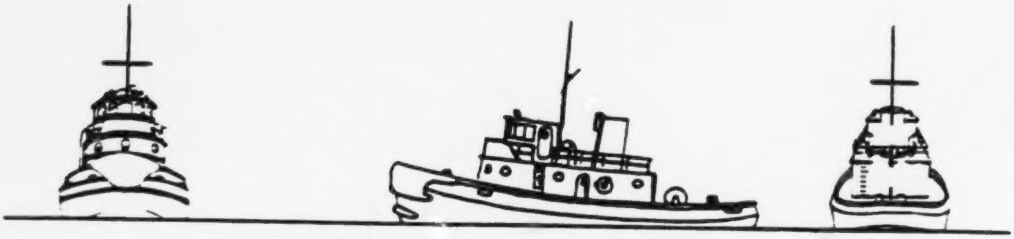
A vessel less than 50 meters in length

Aground

A vessel aground shows a combination of lights. It shows both anchor lights appropriate for its length and two red all-round lights in a vertical line where best seen.



A vessel 50 meters or greater in length



A vessel less than 50 meters in length

The Rhymes

Red Over Green, Sailing Machine

White Over White, Towing at Night

Red Over White, We'll be Fishing all Night

Green Over White, Trawling at Night

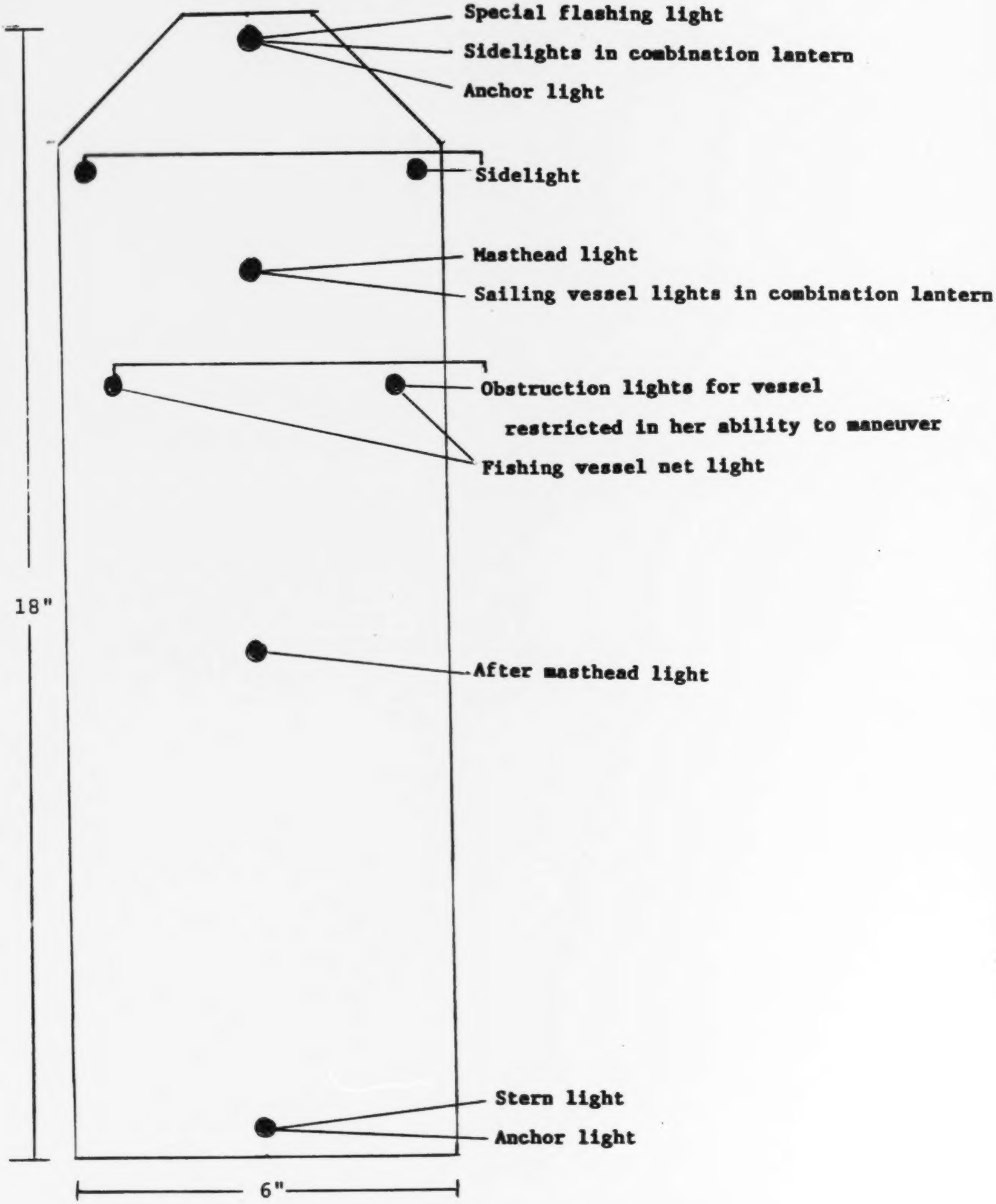
White Over Red, Pilot Ahead

Red Over Red, Pilot is Dead

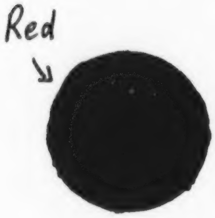
APPENDIX E

MODEL DIAGRAMS

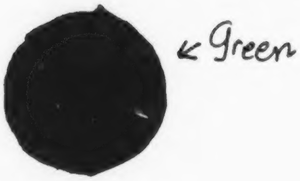
HULL DIAGRAM


Special flashing light
Sidelights in combination lantern
Anchor light
Sidelight
Masthead light
Sailing vessel lights in combination lantern
Obstruction lights for vessel restricted in her ability to maneuver
Fishing vessel net light
After masthead light
Stern light
Anchor light
18"
6"

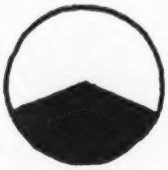
ARCS OF VISIBILITY OF LIGHTS



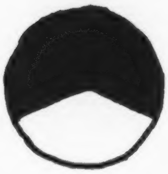
Port sidelight



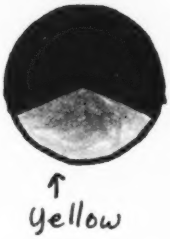
Starboard sidelight



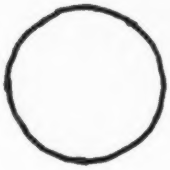
Masthead light



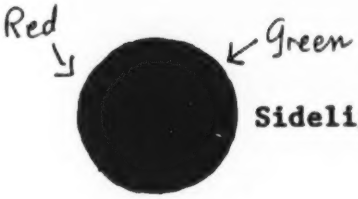
Stern light



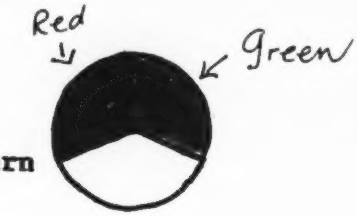
Towing light



All-round light

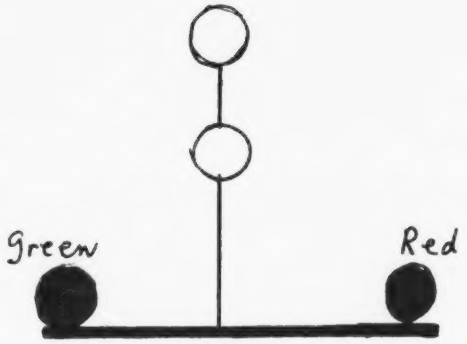


Sidelights in combination lantern

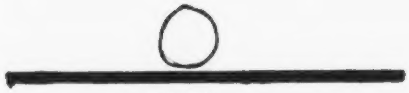


Sailing vessel lights in combination lantern

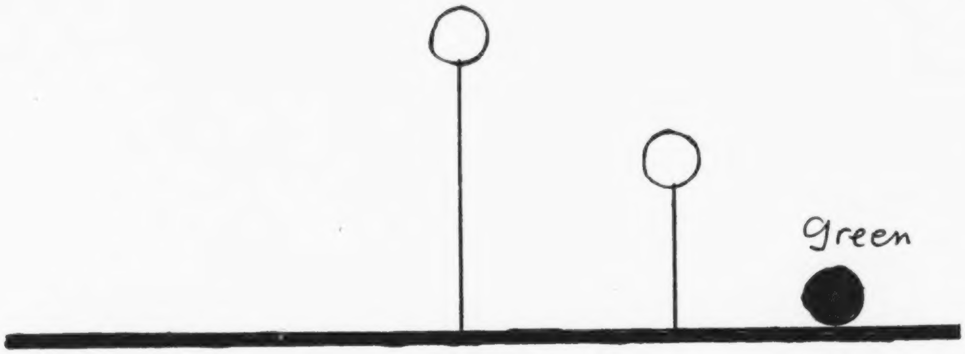
POWER DRIVEN VESSEL GREATER THAN 50 METERS IN LENGTH



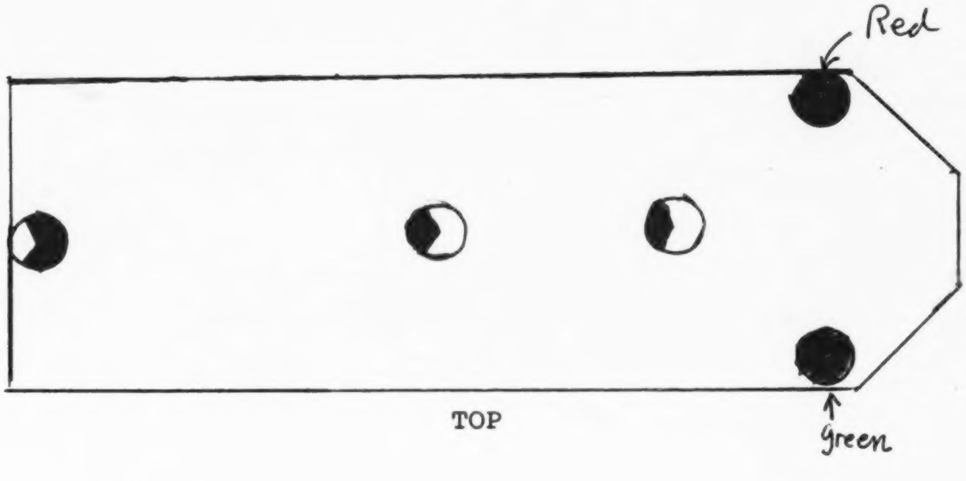
FRONT



BACK

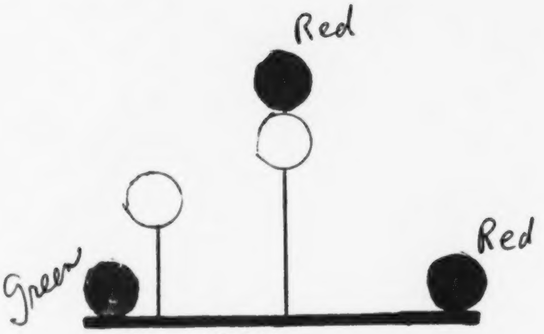


SIDE

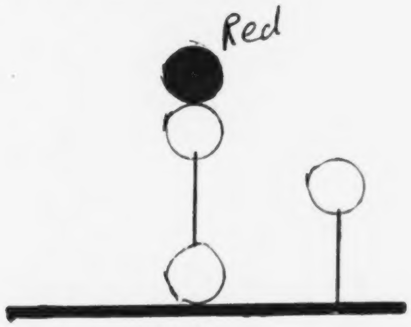


TOP

FISHING VESSEL LESS THAN 50 METERS IN LENGTH WITH NETS OUT TO ITS STARBOARD SIDE



FRONT



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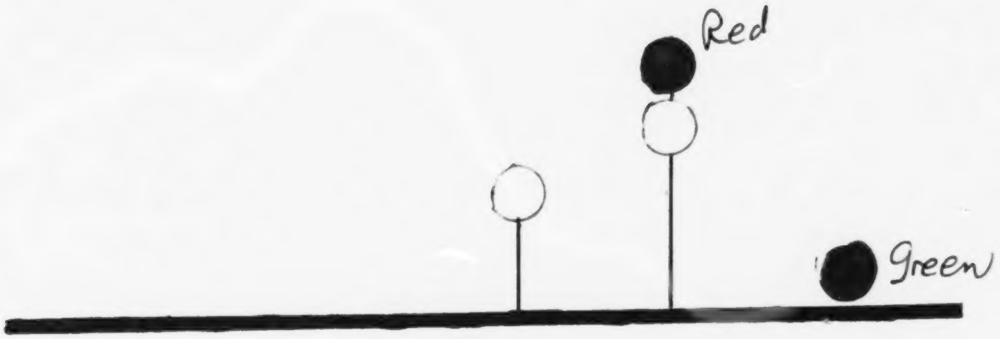
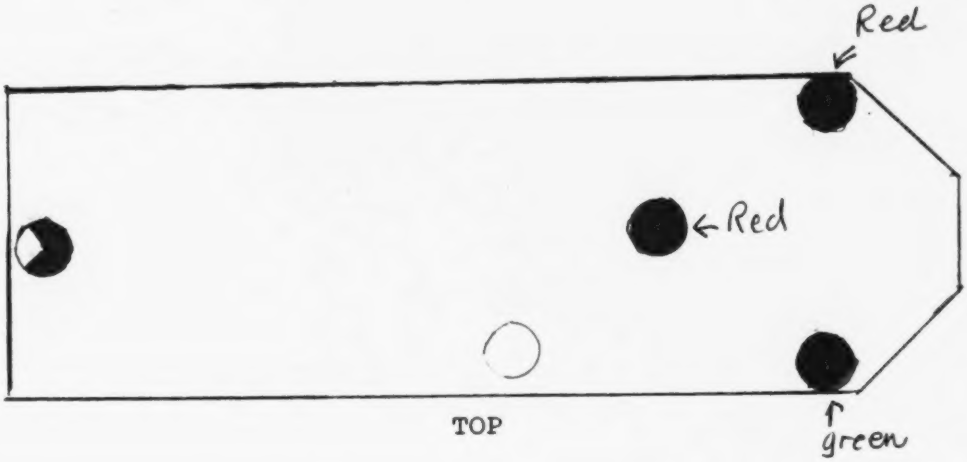
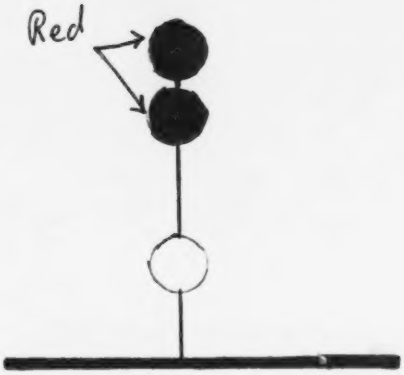


SIDE



TOP

VESSEL GREATER THAN 50 METERS IN LENGTH AGROUND



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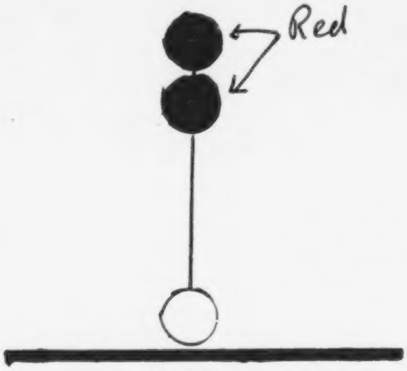

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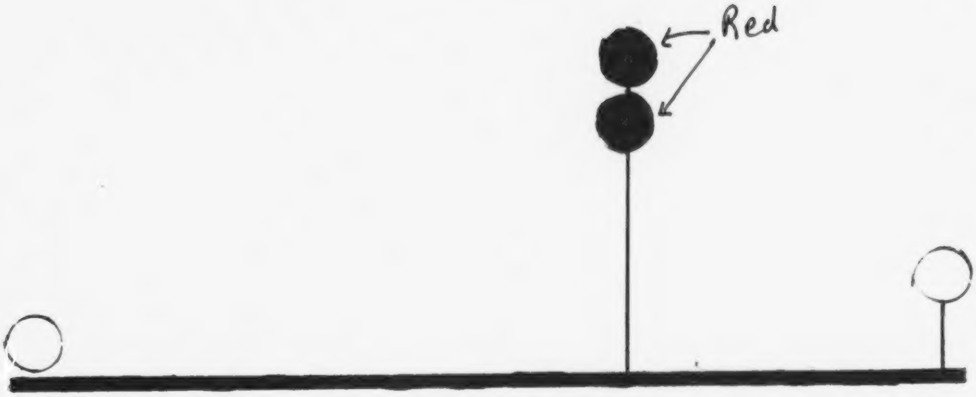
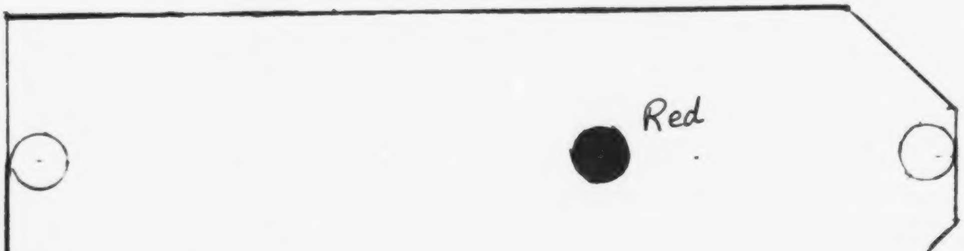


SIDE



TOP

APPENDIX F

PRETEST

NAVIGATION RULES PRETEST

Name________________________________

Address______________________________

City________________________________

State______________Zip_______________

Day Phone___________________________

Evening Phone________________________

READ ALL THE INSTRUCTIONS BEFORE STARTING THE TEST

The course you are about to take picks up where the Coast Guard Auxiliary boating safety course leaves off. You need to understand that course's information, or else, this course will not make sense.

This test will tell the instructor if you remember and understand the Navigation Rules material from your boating safety course. If you do well, you are ready for class. If you do not do quite so well, you may be asked to reread the Navigation Rules chapter and review your homework, before the first class of this new course.

There are some questions on this pretest you may not be able to answer, because you have not been taught the material those questions ask. This was done to find out how much you already know about the Navigation Rules before you take this course. These questions will not count against you. You will not be asked to reread the Navigation Rules chapter or review your homework, if you miss those questions.

PLEASE, take this pretest closed-book. You might bias the results if you refer back to your text and notes. You may cheat yourself out of a review you may need and, as a result, be lost in the class. Besides, you probably won't carry your text with you when you go boating.

When you finish the pretest, send it to the instructor in the envelope provided. The instructor will grade it and let you know how you did. Try to get the pretest to the instructor a week before the first class.

When you come to the first class of this course, you may find it helpful if you bring colored pencils, pens, or markers. These may help you take better notes. The colors you will need are red, green, yellow, black, and blue.

FOR QUESTIONS ONE THROUGH FIVE FILL IN THE BLANK.

1. A ______________ includes every description of watercraft used or capable of being used as a means of transportation on water.

2. A ______________ ______________ vessel is any vessel propelled by machinery.

3. ____________________________ means that a vessel is not at anchor, or made fast to the shore, or aground.

4. A masthead light is a __________ colored light placed over the fore and aft centerline of the vessel showing an unbroken light over an arc of the horizon of 225 degrees and so fixed as to show the light from right ahead to 22.5 degrees abaft the beam on either side of the vessel.

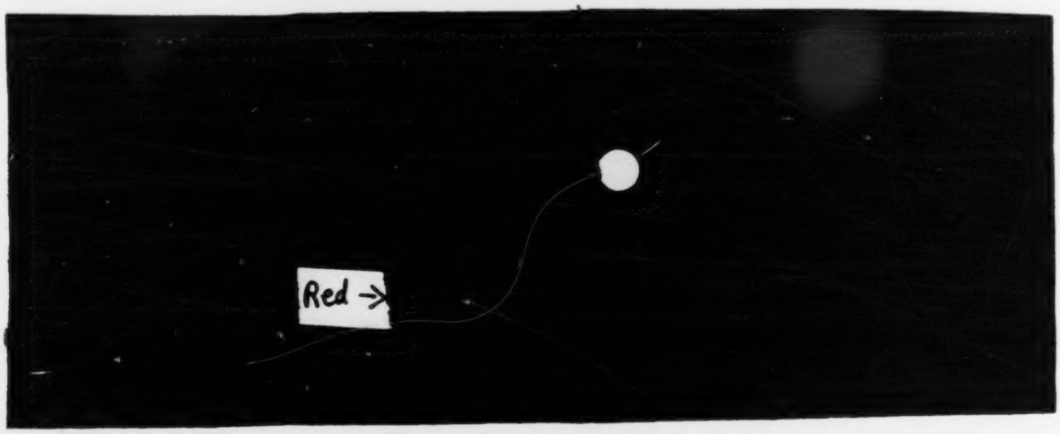
5. The starboard sidelight is _________ colored and the port sidelight is ______ colored.

CIRCLE THE CORRECT ANSWER FOR QUESTION SIX.

6. The Navigation Rules apply:

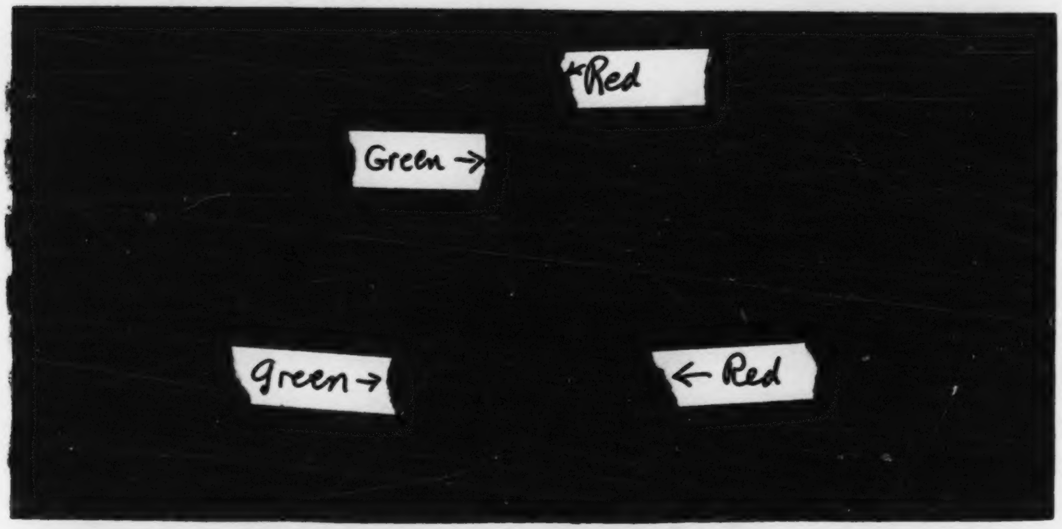
   A. Only to commercial vessels
   B. Only when a vessel is underway
   C. To all vessels
   D. To all vessels except pleasure craft and sailboats

THE FOLLOWING QUESTIONS ARE BASED ON THE DIAGRAM ABOVE EACH QUESTION. THE DIAGRAM REPRESENTS THE LIGHTING CONFIGURATION OF A VESSEL AT NIGHT. CIRCLE THE CORRECT ANSWER FOR EACH QUESTION.



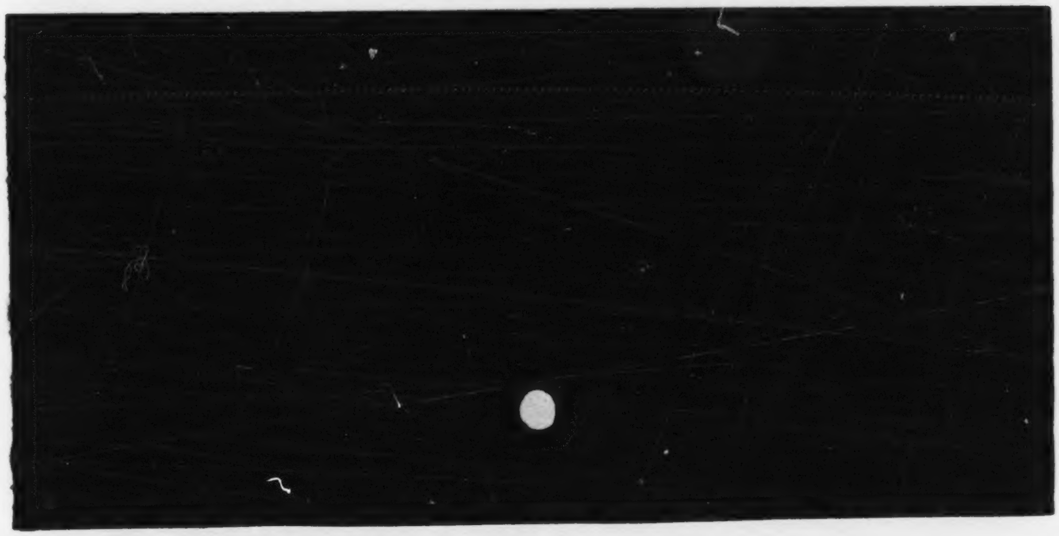
7. In which direction is this vessel headed?

   A. Straight at you, a meeting situation
   B. Away from you, an overtaking situation
   C. From right to left, a crossing situation
   D. From left to right, a crossing situation



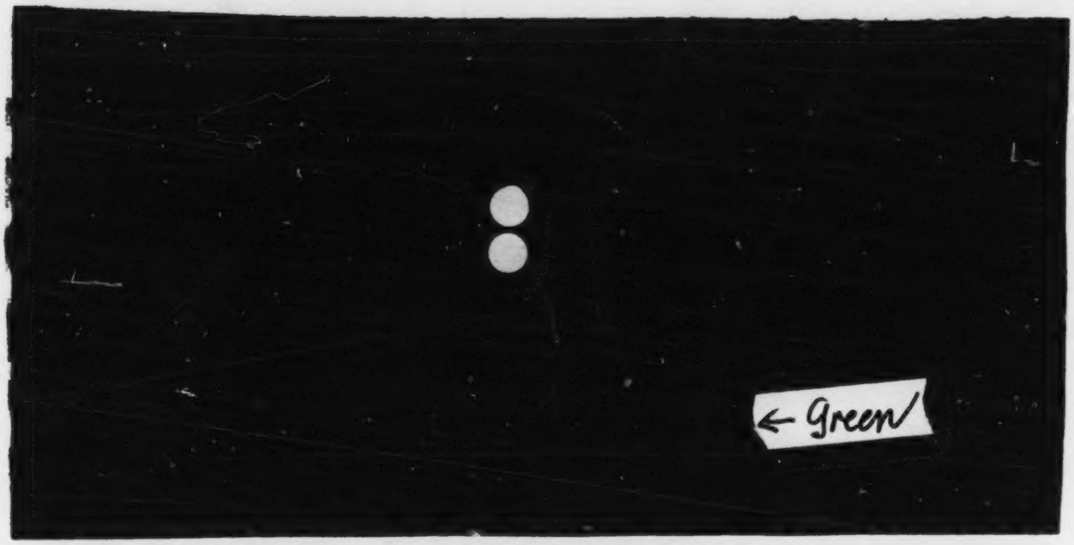
8. In which direction is this vessel headed?

A. Straight at you, a meeting situation
B. Away from you, an overtaking situation
C. From right to left, a crossing situation
D. From left to right, a crossing situation



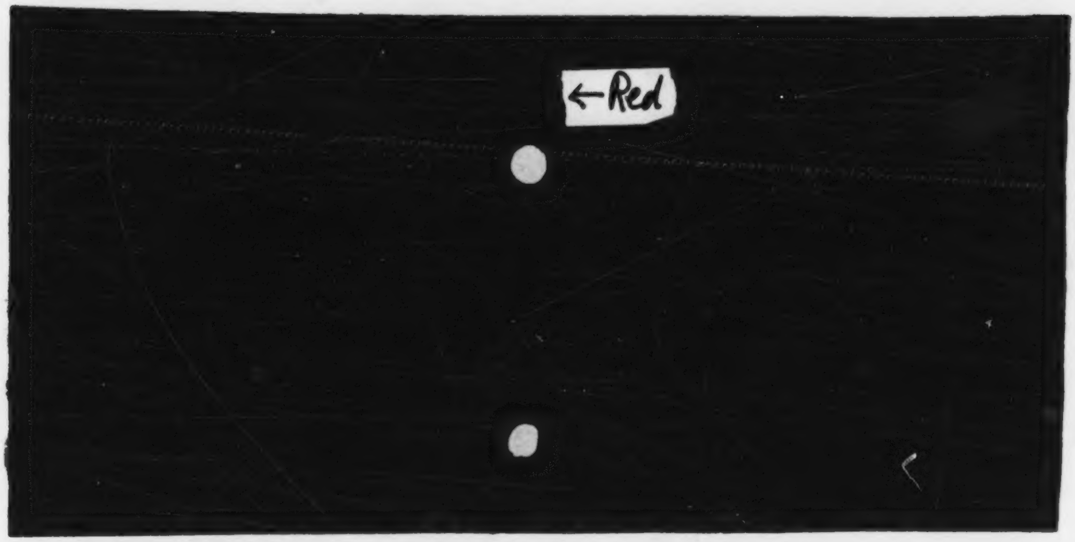
9. In which direction is this vessel headed?

A. Straight at you, a meeting situation
B. Away from you, an overtaking situation
C. From right to left, a crossing situation
D. From left to right, a crossing situation



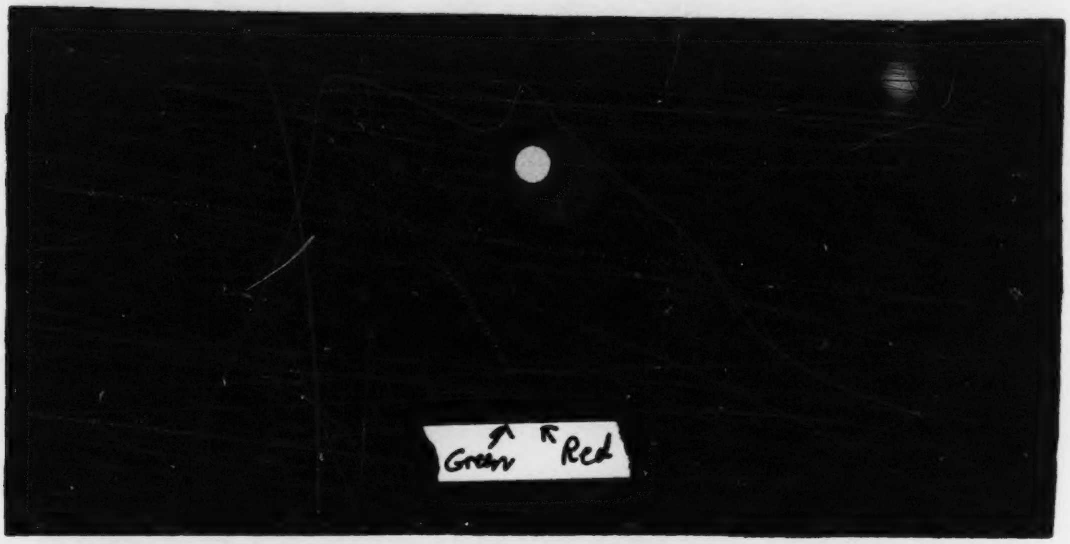
10. In which direction is this vessel headed?

A. Straight at you, a meeting situation
B. Away from you, an overtaking situation
C. From right to left, a crossing situation
D. From left to right, a crossing situation



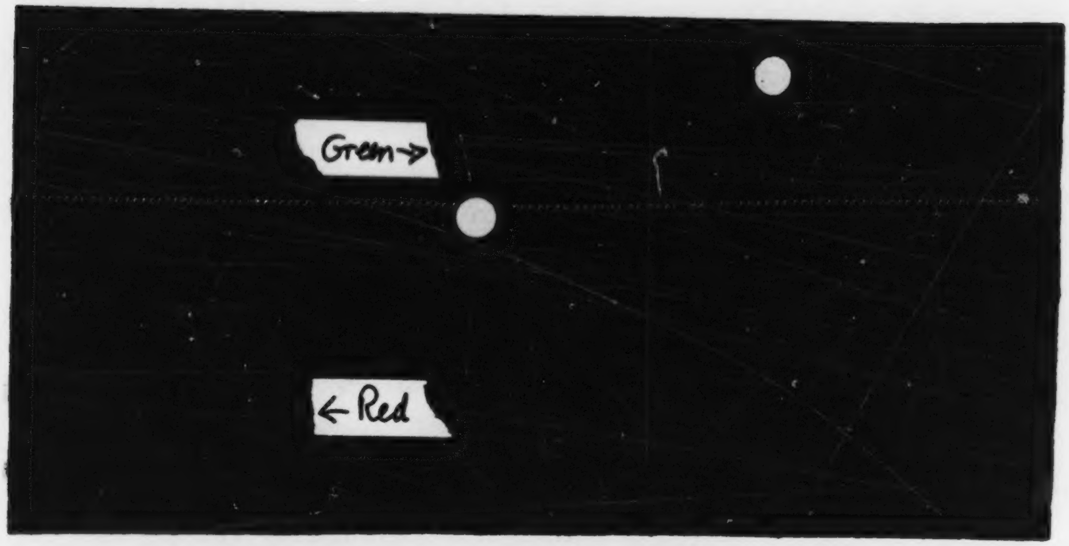
11. In which direction is this vessel headed?

A. Straight at you, a meeting situation
B. Away from you, an overtaking situation
C. From right to left, a crossing situation
D. From left to right, a crossing situation



12. In which direction is this vessel headed?

    A. Straight at you, a meeting situation
    B. Away from you, an overtaking situation
    C. From right to left, a crossing situation
    D. From left to right, a crossing situation

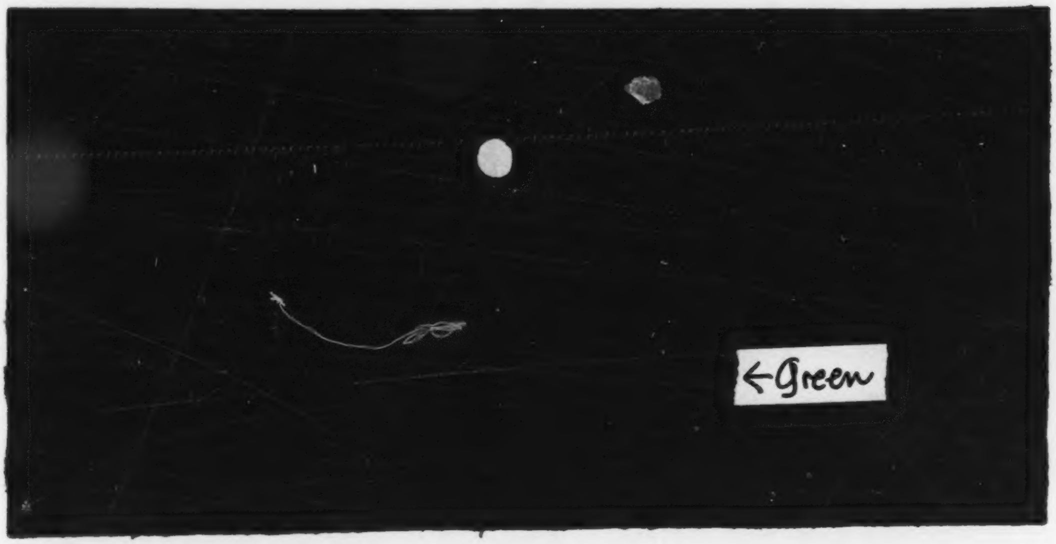


13. In which direction is this vessel headed?

    A. Straight at you, a meeting situation
    B. Away from you, an overtaking situation
    C. From right to left, a crossing situation
    D. From left to right, a crossing situation

14. What is this vessel?

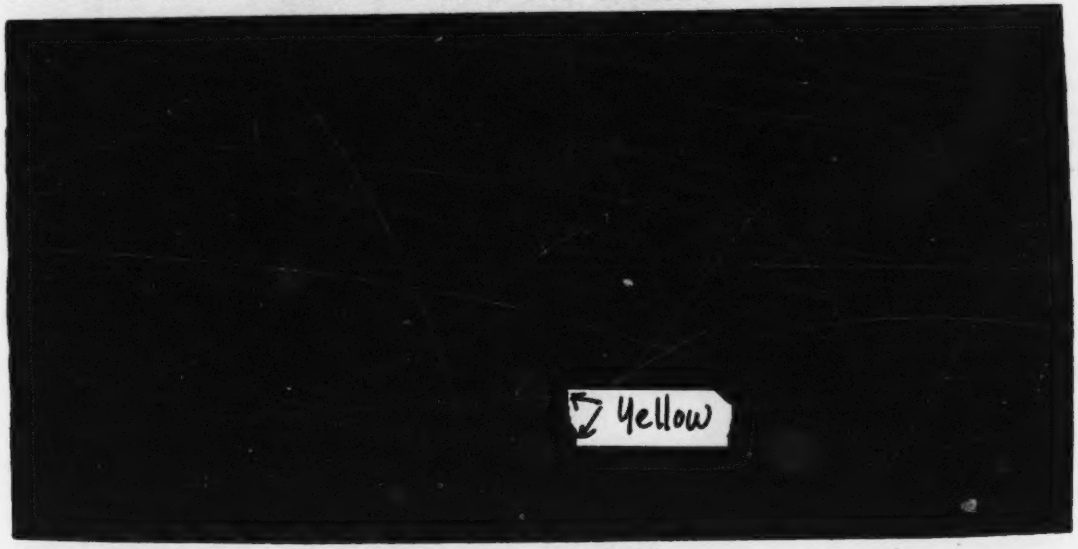
A. A sail boat underway
B. A power driven vessel underway
C. A power driven vessel towing
D. A vessel at anchor



15. What is this vessel?

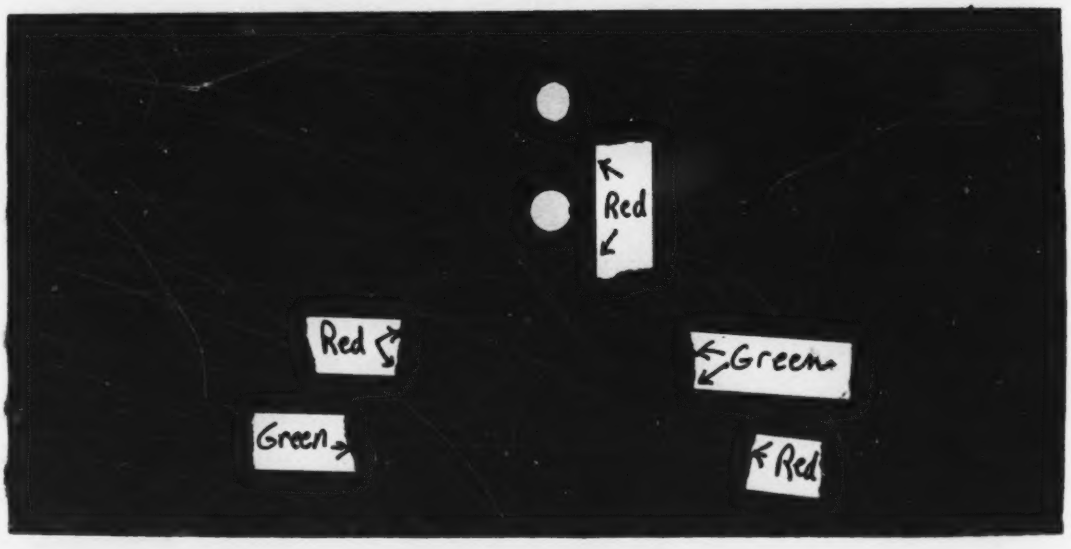
A. A sail boat underway
B. A power driven vessel underway
C. A power driven vessel towing
D. A vessel at anchor

THESE NEXT TEN QUESTIONS YOU MAY NOT KNOW, BUT GIVE THEM A TRY. YOU WILL NOT BE PENALIZED FOR MISSING THEM. WE WOULD LIKE TO SEE HOW MUCH YOU KNOW BEFORE YOU TAKE THE COURSE.



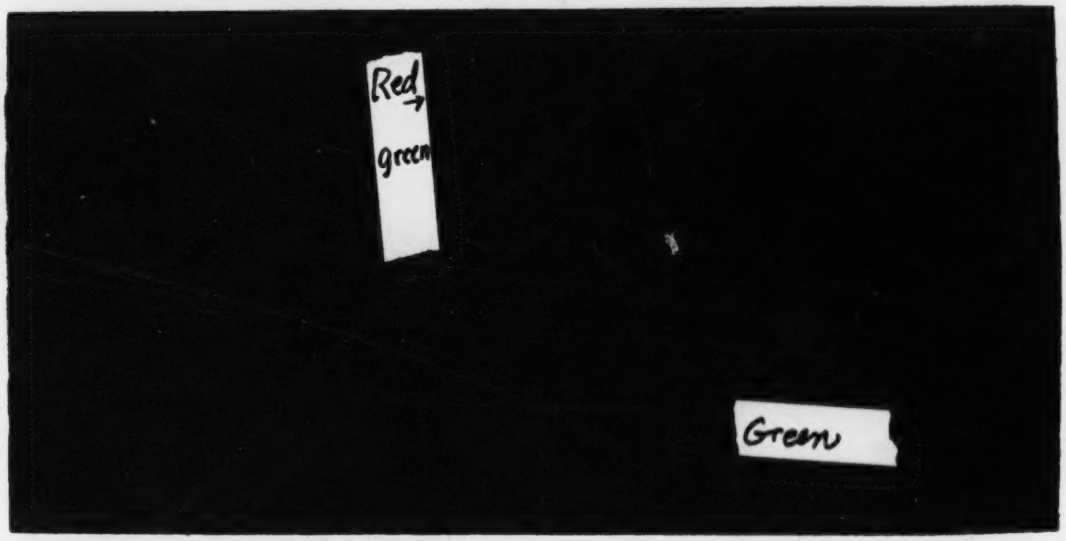
16. What direction is this vessel headed?

A. Straight at you, a meeting situation
B. Away from you, an overtaking situation
C. From right to left, a crossing situation
D. From left to right, a crossing situation



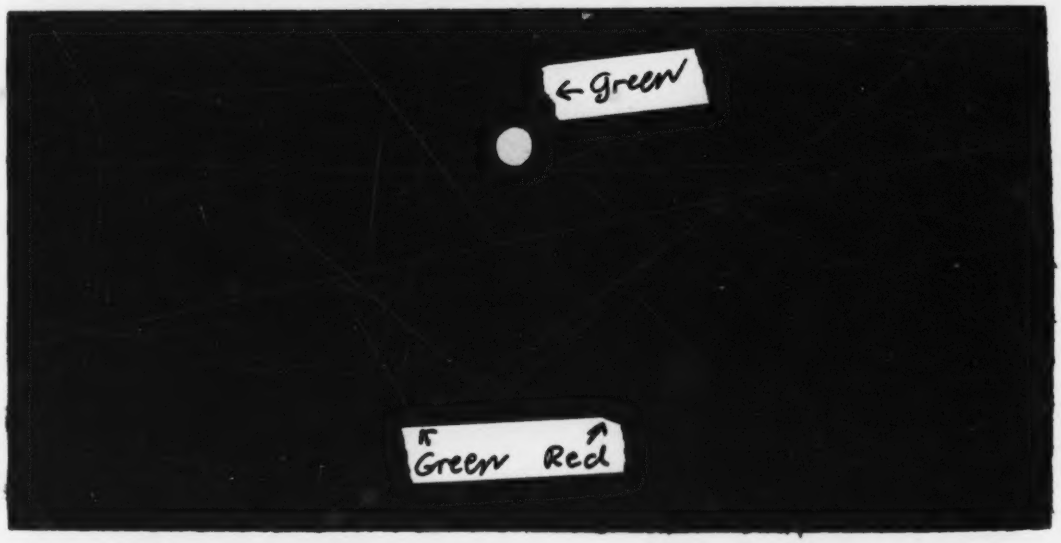
17. What direction is this vessel headed?

A. Straight at you, a meeting situation
B. Away from you, an overtaking situation
C. From right to left, a crossing situation
D. From left to right, a crossing situation



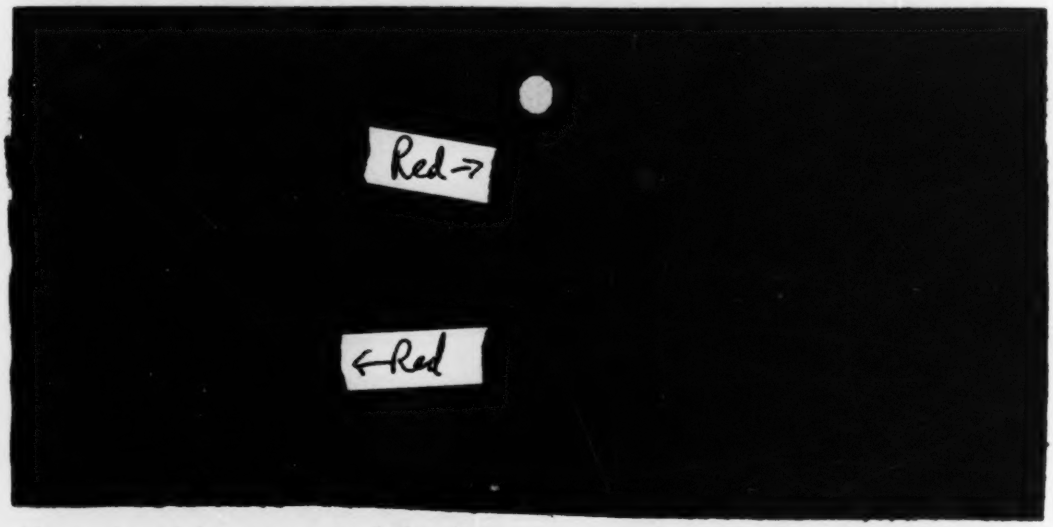
18. What is this vessel doing?

A. Sailing
B. Fishing
C. Towing
D. Anchored



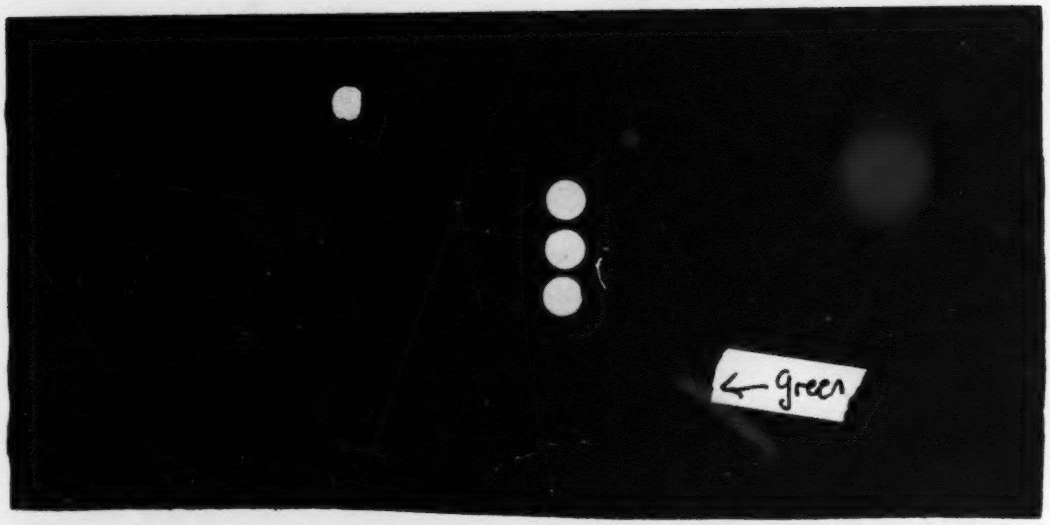
19. What is this vessel doing?

A. Fishing
B. Anchored
C. Pilotage duty
D. Trawling



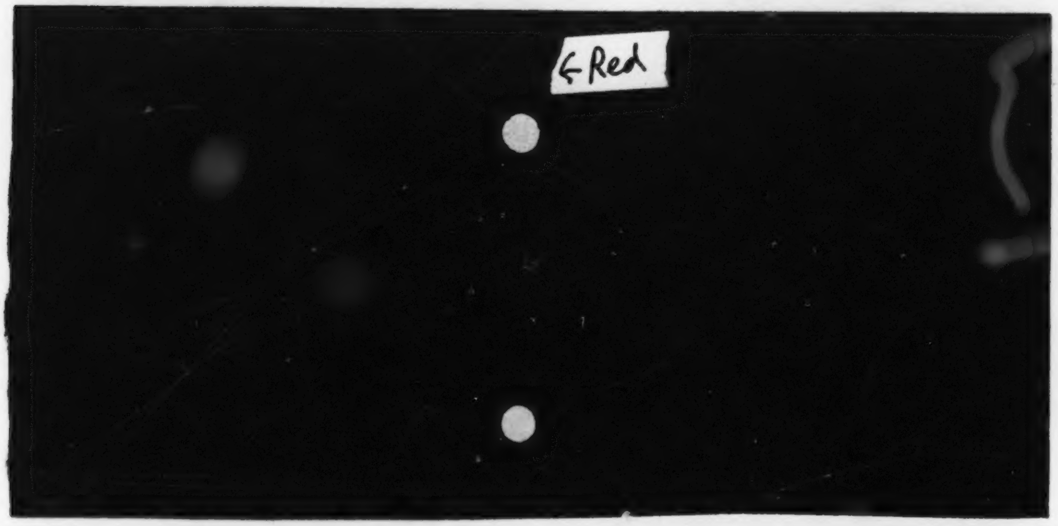
20. What is this vessel doing?

A. Fishing
B. Towing
C. Pilotage duty
D. Anchored



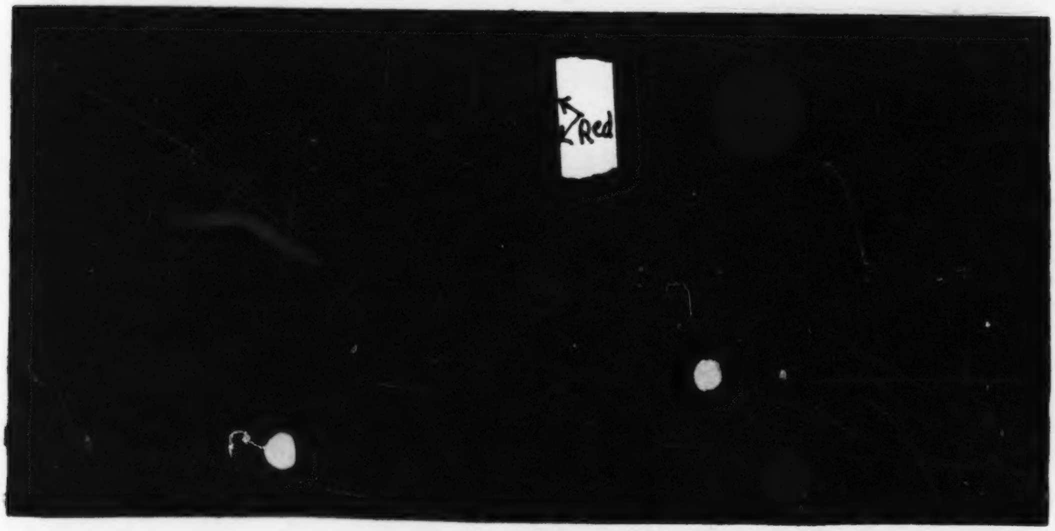
21. What is this vessel doing?

A. Minesweeping
B. Towing
C. Anchored
D. Pilotage duty



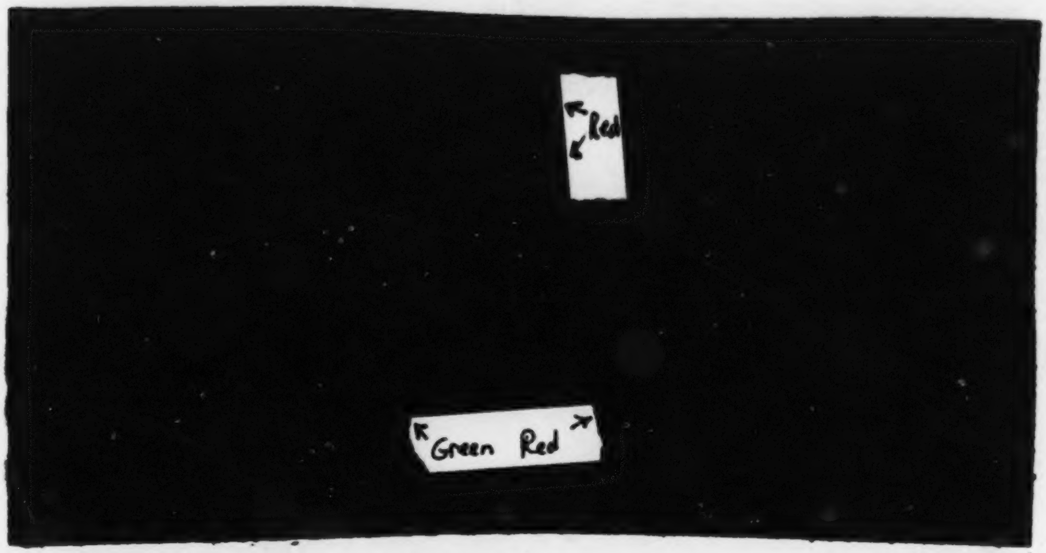
22. What is this vessel doing?

    A. Towing
    B. Pilotage duty
    C. Fishing
    D. Minesweeping



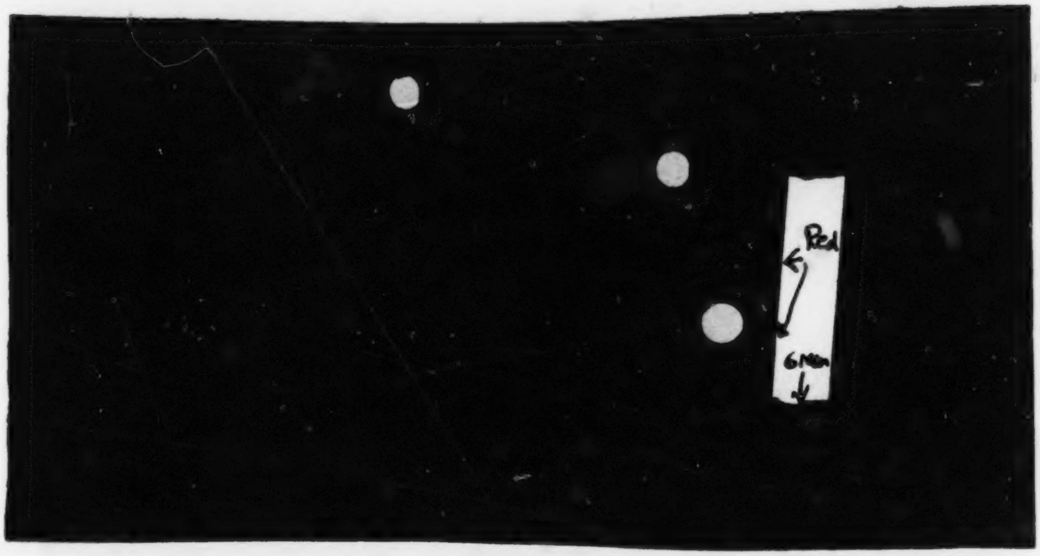
23. What has happened to this vessel?

    A. It is Not Under Command
    B. It is Restricted in its Ability to Maneuver
    C. It is Anchored
    D. It is Aground



24. What has happened to this vessel?

A. It is Not Under Command
B. It is Restricted in its Ability to Maneuver
C. It is Anchored
D. It is Aground



25. What has happened to this vessel?

A. It is Not Under Command
B. It is Restricted in its Ability to Maneuver
C. It is Anchored
D. It is Aground

PRETEST ANSWER KEY

1. Vessel
2. Power Driven
3. Underway
4. White
5. Green, Red (in that order)
6. C
7. C
8. A
9. B
10. D
11. B
12. A
13. C
14. A
15. B
16. B
17. A
18. A
19. D
20. C
21. B
22. C
23. D
24. A
25. B

APPENDIX G

POST TEST

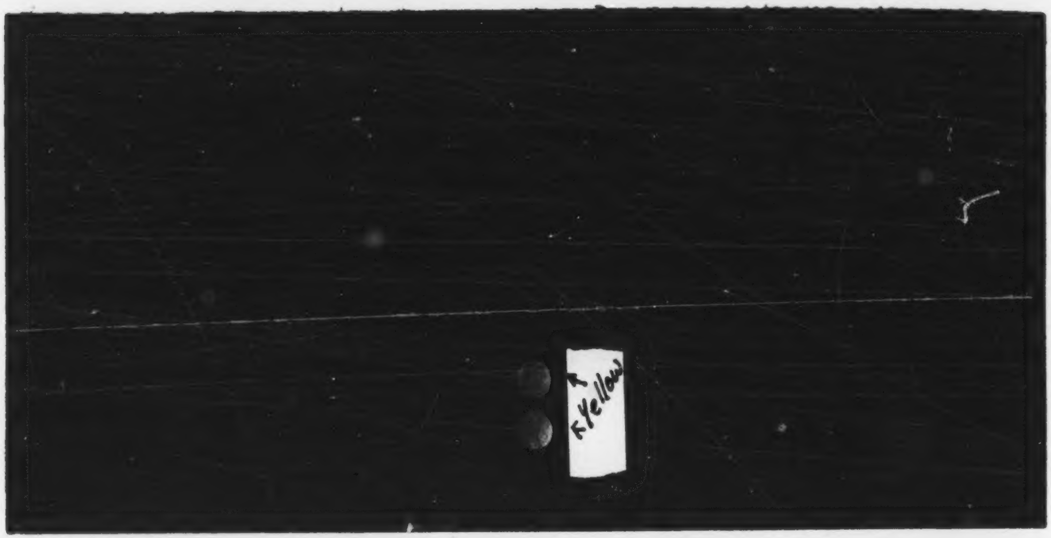
Navigation Rules Post Test

IMPORTANT: Read all instructions before beginning this test.

INSTRUCTIONS: Mark all answers in pencil on the separate answer sheet. Do not write on this test. The questions on this test are multiple choice. Read each question slowly and carefully. Then choose the **best** answer and fill in that circle on the answer sheet. If you wish to change an answer, erase your first answer completely. Return this test to your instructor when you are finished. You have one hour to complete this test.

This test has 25 questions. The passing score is 80%. You may miss no more than five questions to pass.

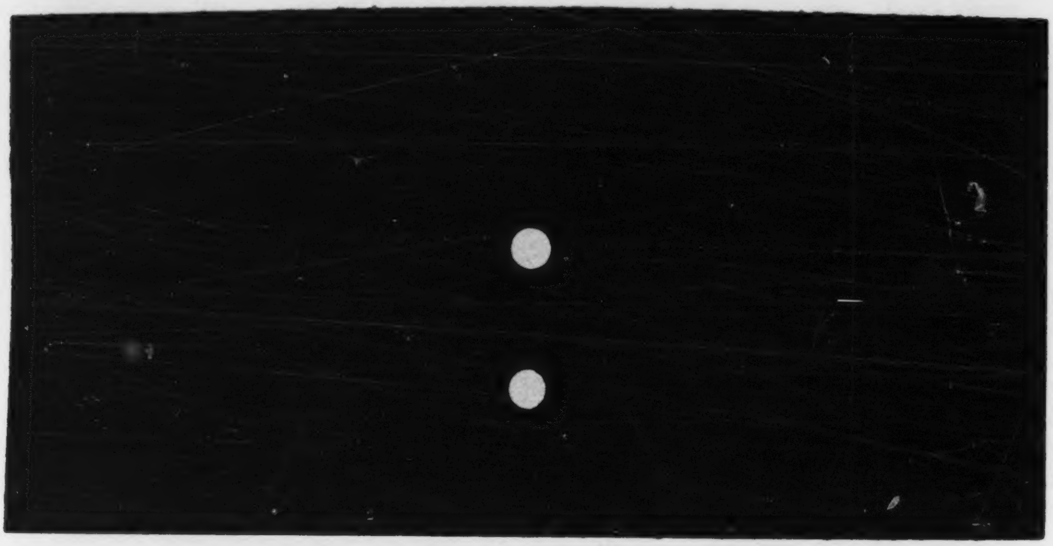
Each question is based on the diagram above it. The diagram represents the lighting configuration of a vessel or vessels at night.



1. In which direction is this vessel headed?

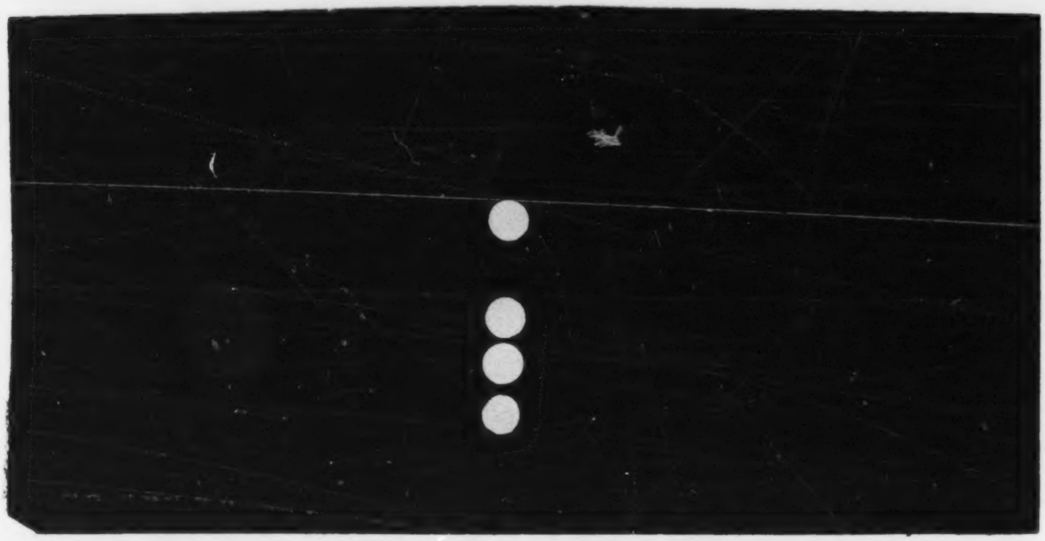
   A. Straight at you, a meeting situation
   B. Away from you, an overtaking situation
   C. From right to left, a crossing situation
   D. From left to right, a crossing situation

IN QUESTIONS TWO THROUGH FIVE, NO SIDELIGHTS OR STERN LIGHTS ARE VISIBLE



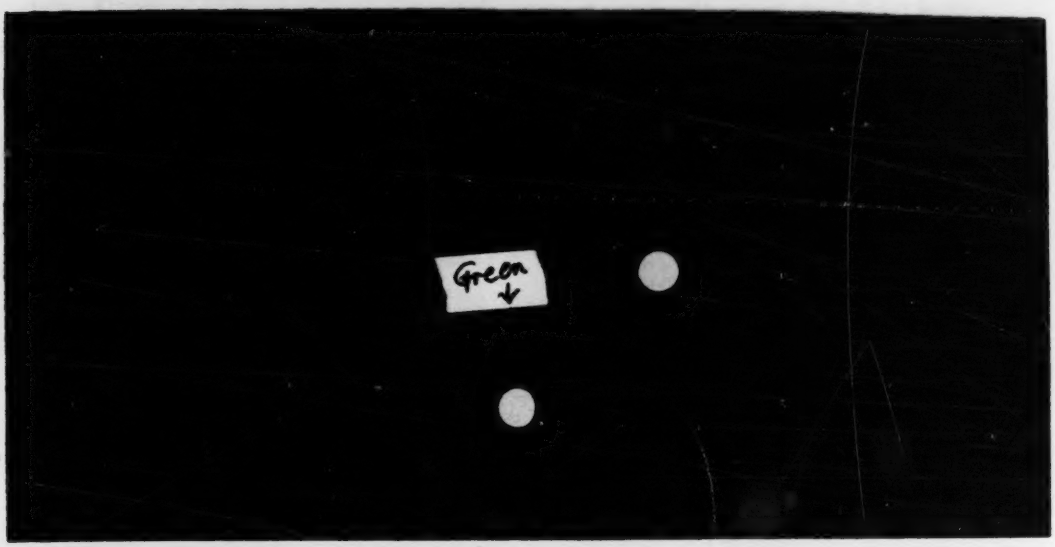
2. In which direction is this vessel headed?

   A. Straight at you, a meeting situation
   B. Away from you, an overtaking situation
   C. From right to left, a crossing situation
   D. From left to right, a crossing situation



3. In which direction is this vessel headed?

   A. Straight at you, a meeting situation
   B. Away from you, an overtaking situation
   C. From right to left, a crossing situation
   D. From left to right, a crossing situation

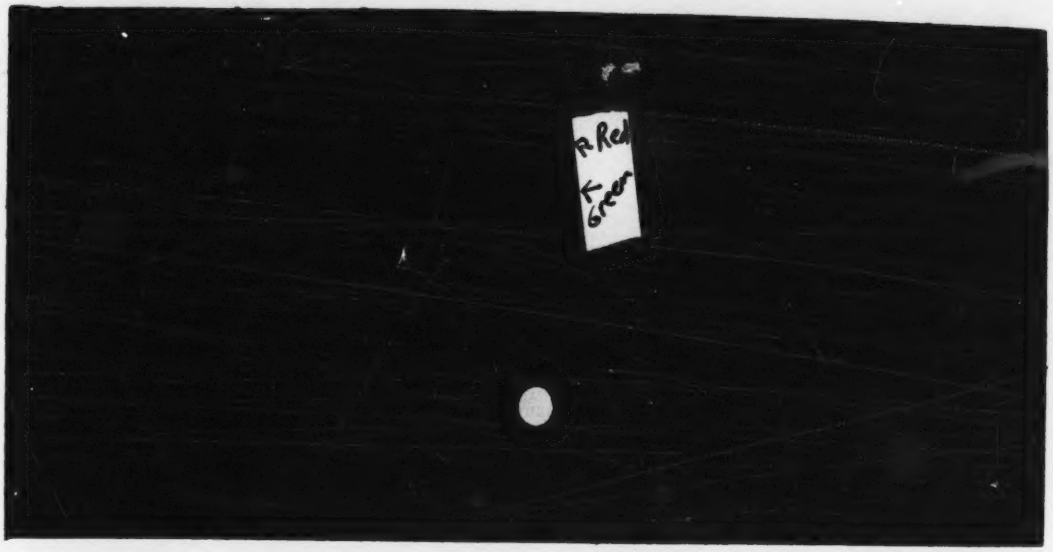


4. In which direction is this vessel headed?

   A. Straight at you, a meeting situation
   B. Away from you, an overtaking situation
   C. From right to left, a crossing situation
   D. From left to right, a crossing situation

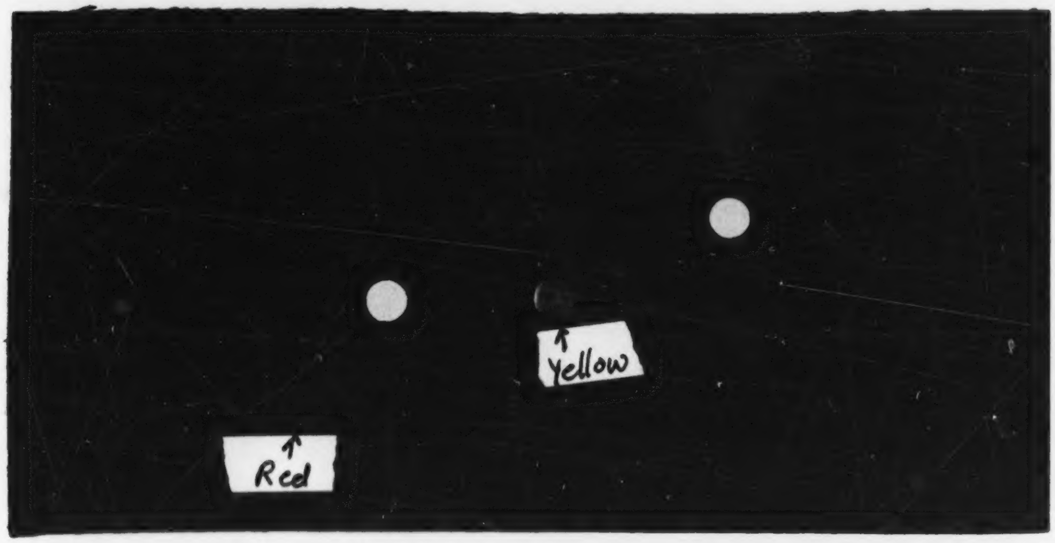
5. In which direction is this vessel headed?

   A. Straight at you, a meeting situation
   B. Away from you, an overtaking situation
   C. From right to left, a crossing situation
   D. From left to right, a crossing situation



6. What is this vessel doing?

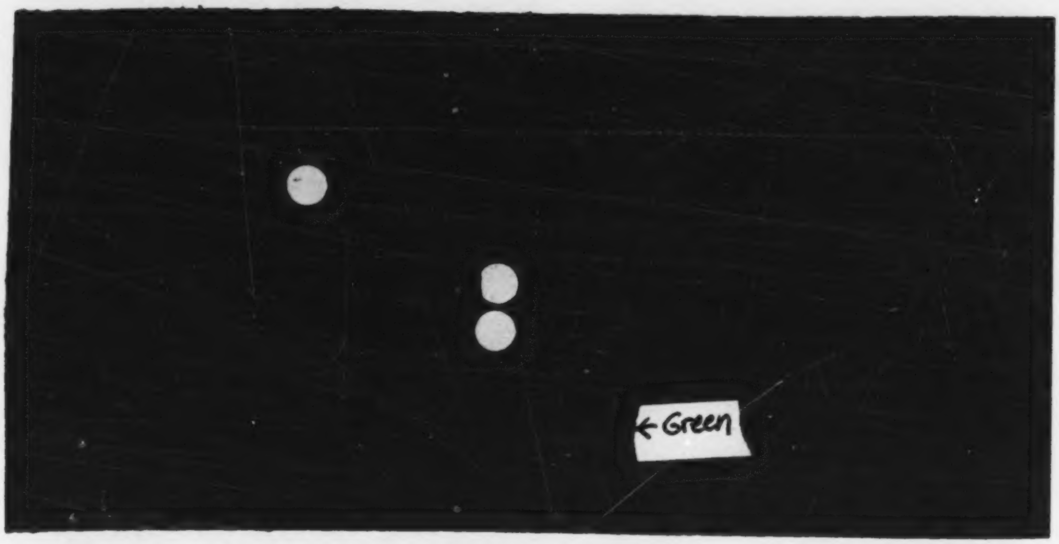
   A. Fishing
   B. Sailing
   C. Being towed
   D. Air cushion vehicle underway



The yellow light is flashing 120 times per minute

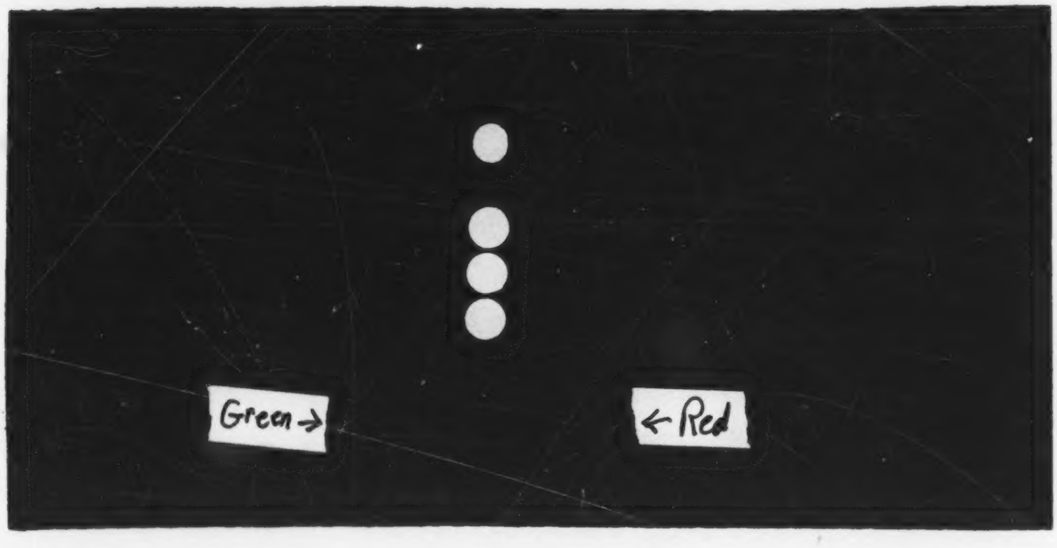
7. What is this vessel doing?

   A. Trawling
   B. Sailing
   C. Anchored
   D. Air cushion vehicle underway



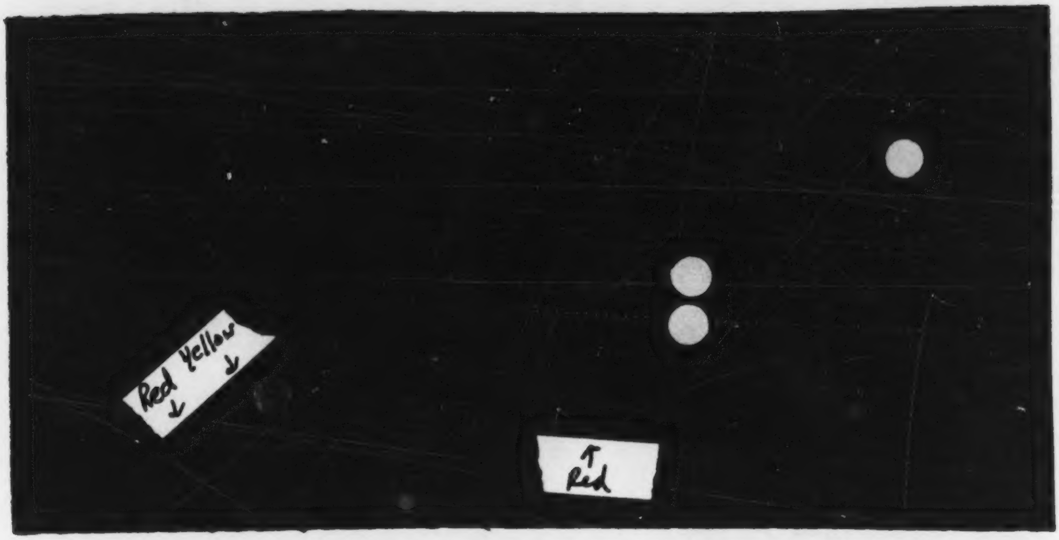
8. What is this vessel doing?

A. Towing astern with a tow greater than 200 meters in length
B. Towing astern with a tow 200 meters or less in length
C. Towing astern with a tow greater than 500 meters in length
D. A submarine running surfaced



9. What is this vessel doing?

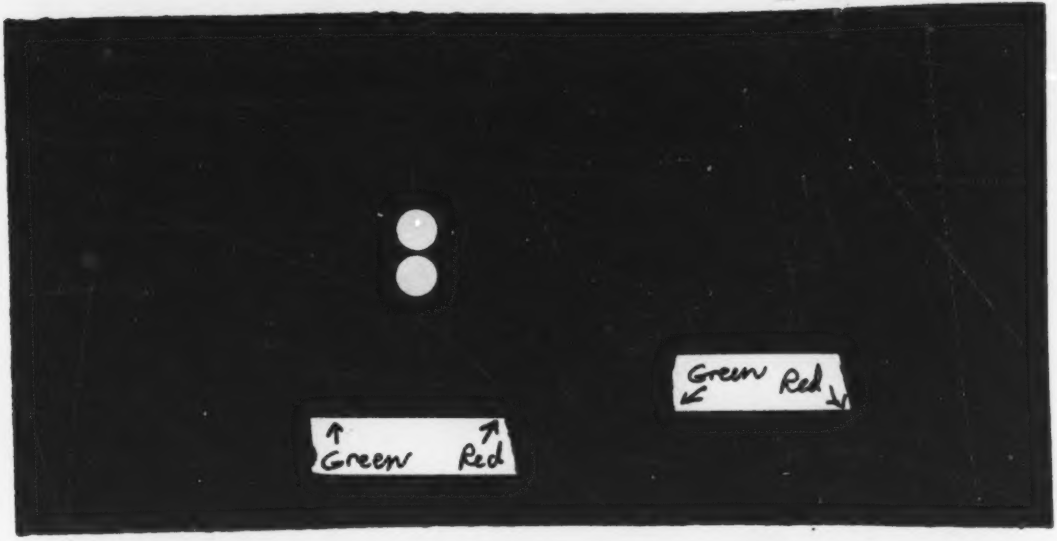
A. Towing astern with a tow greater than 200 meters in length
B. Towing astern with a tow 200 meters or less in length
C. Pushing ahead
D. Towing alongside



The yellow light is flashing 50 - 70 times per minute

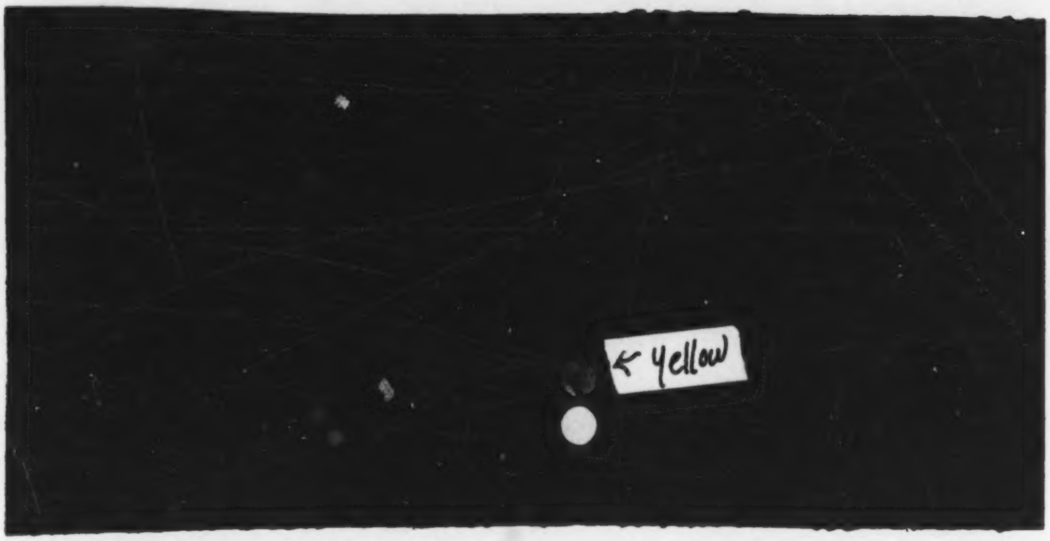
10. What is this vessel doing?

    A. Pushing ahead
    B. Towing alongside
    C. A submarine running surfaced
    D. Composite unit underway



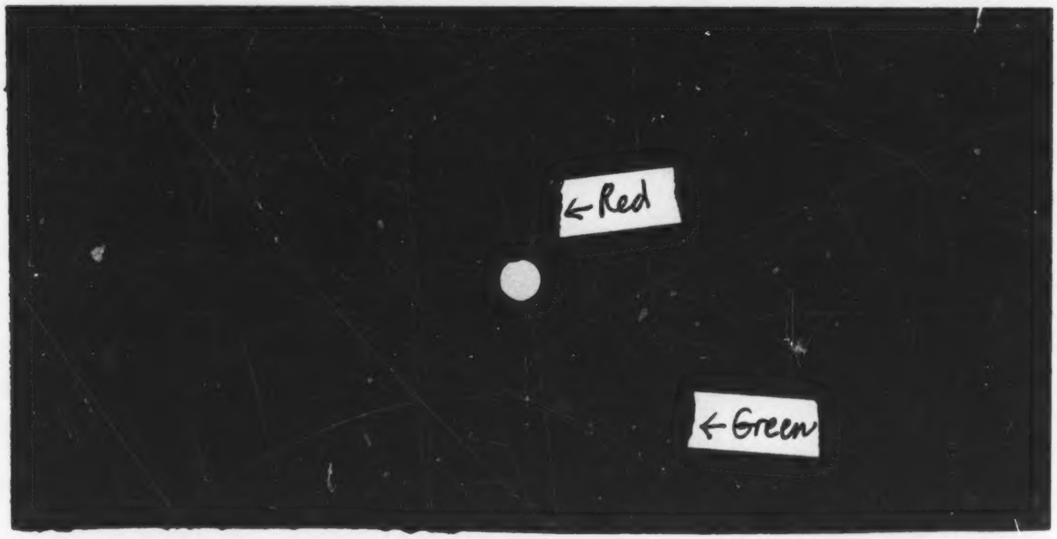
11. What is this vessel doing?

    A. Pushing ahead
    B. Towing alongside
    C. Towing astern
    D. Composite unit underway



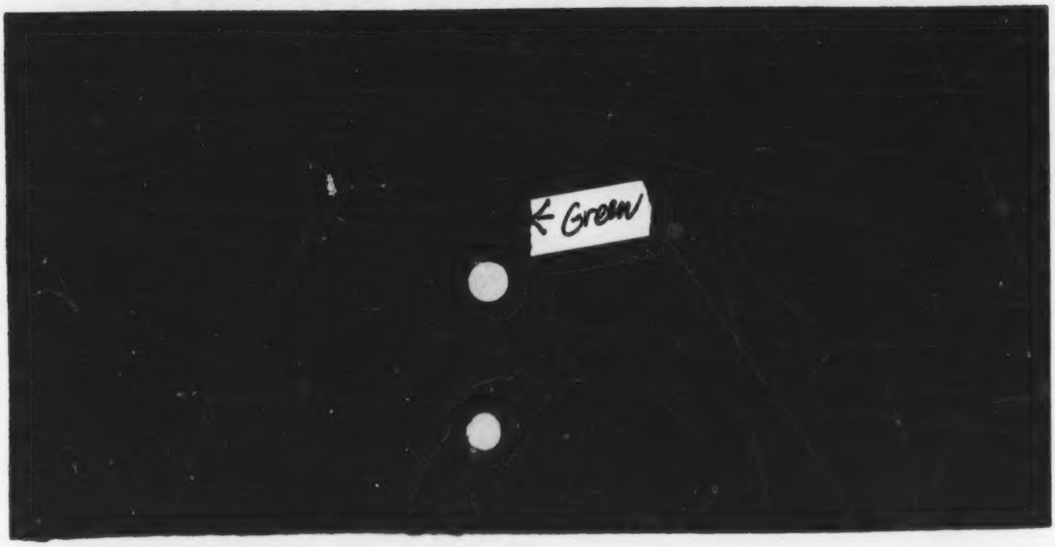
12. What is this vessel doing?

    A. A submarine running surfaced
    B. Towing alongside
    C. Towing astern
    D. A vessel being towed



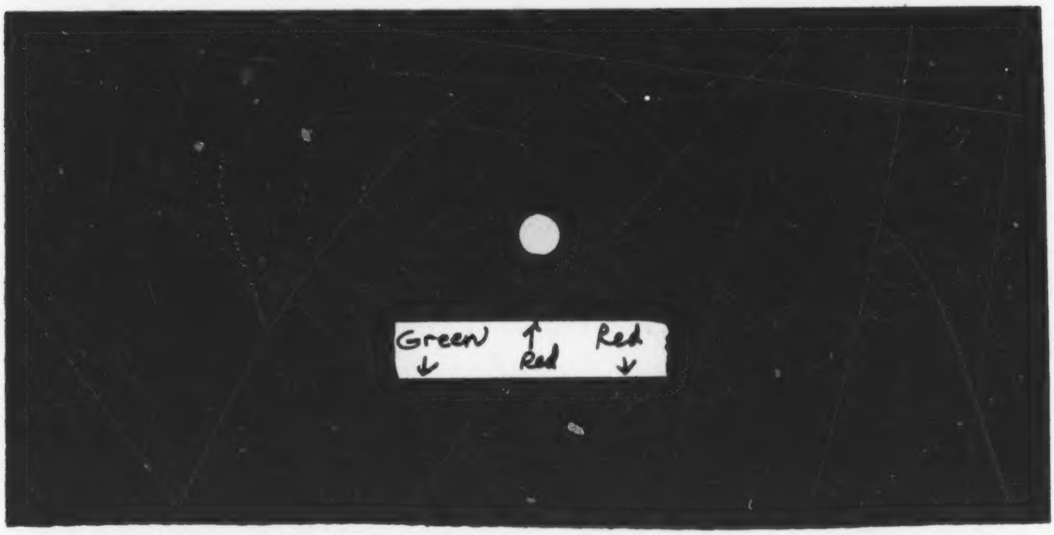
13. What is this vessel doing?

    A. Fishing
    B. Sailing
    C. Pilotage duty
    D. Trawling



14. What is this vessel doing?

    A. Minesweeping
    B. Sailing
    C. Pilotage duty
    D. Trawling

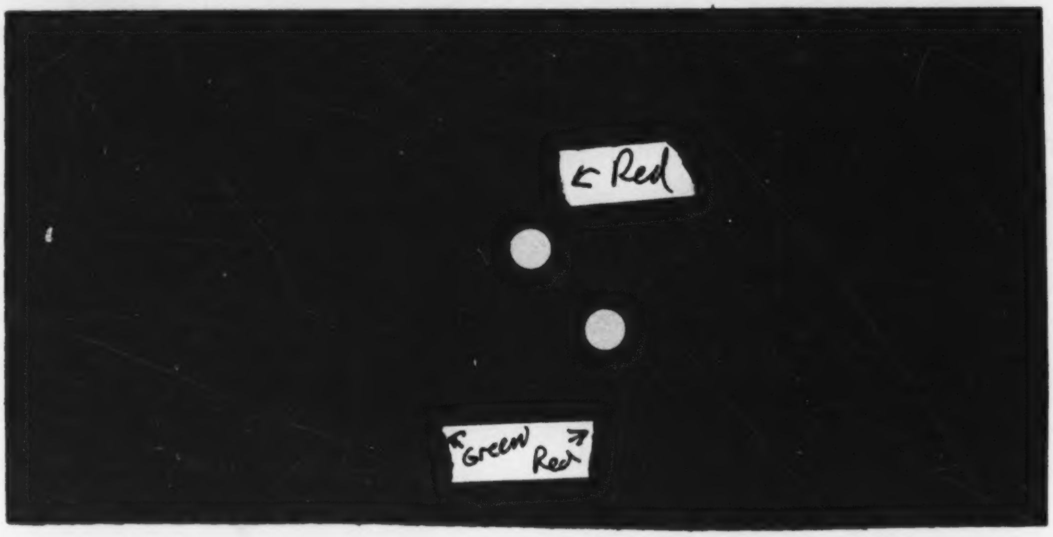


15. What is this vessel doing?

    A. Anchored
    B. Sailing
    C. Pilotage duty
    D. Minesweeping

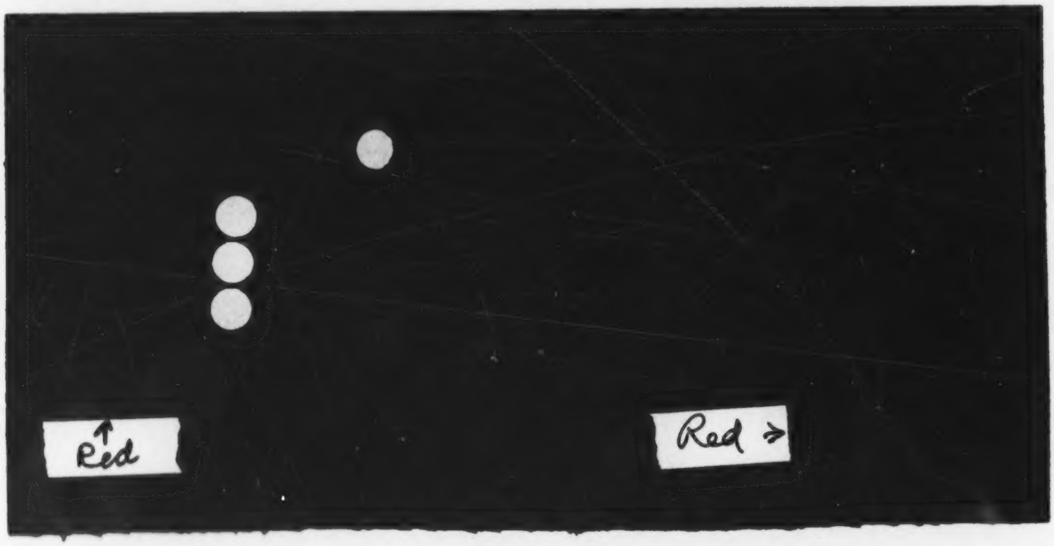
IN QUESTIONS 16 THROUGH 24 CHOOSE THE ANSWER THAT BEST DESCRIBES THE DIAGRAM

16.



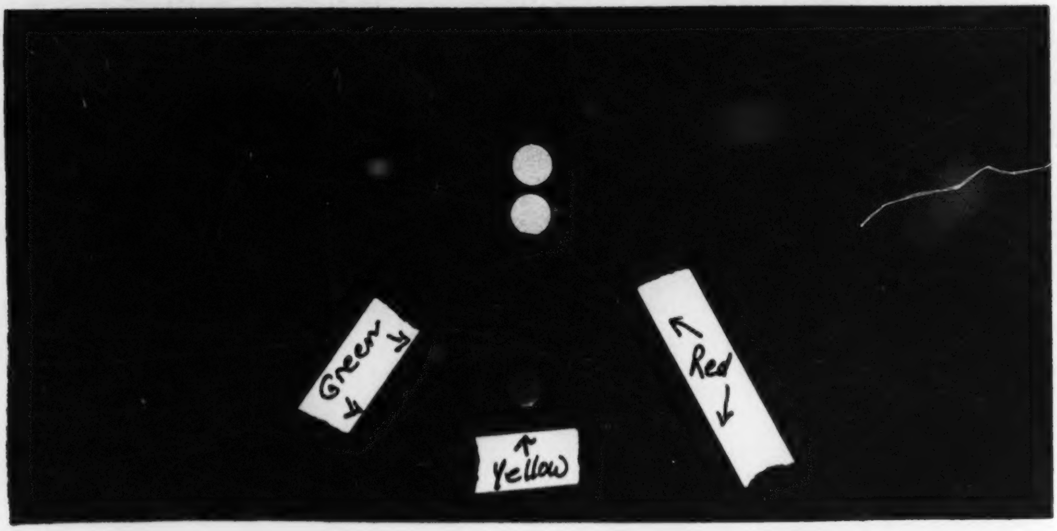
A. A fishing vessel 75 meters in length making way
B. A fishing vessel underway, not making way
C. A fishing vessel underway with gear extending more than 150 feet to its port
D. A trawling vessel 45 meters in length making way

17.



A. A power driven vessel greater than 50 meters in length towing astern with a tow in excess of 200 meters
B. A power driven vessel towing astern with a tow in excess of 200 meters
C. A power driven vessel greater than 50 meters in length towing astern with a tow less than 200 meters
D. A power driven vessel towing astern with a tow less than 200 meters

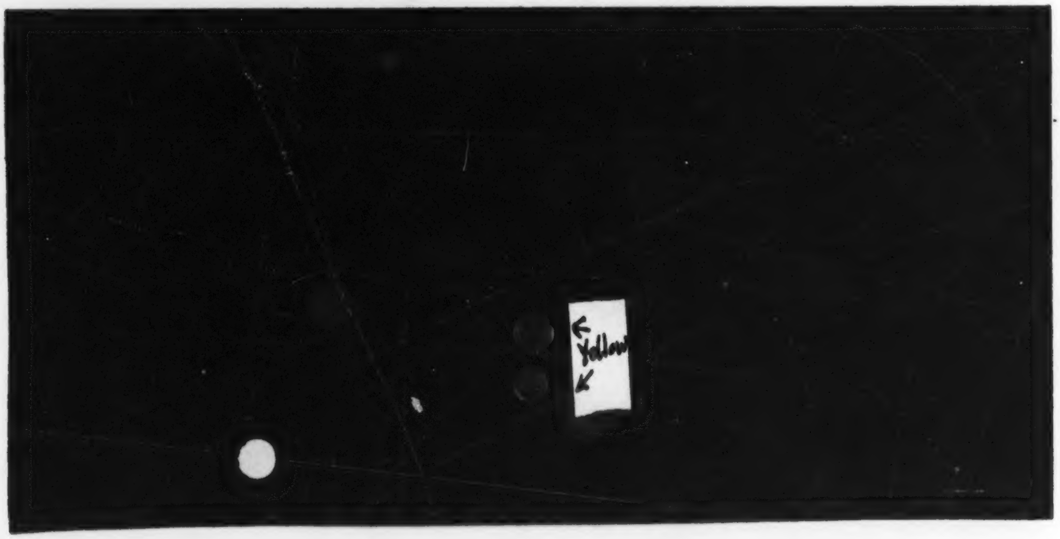
18.



The yellow light is flashing 50 - 70 times per minute

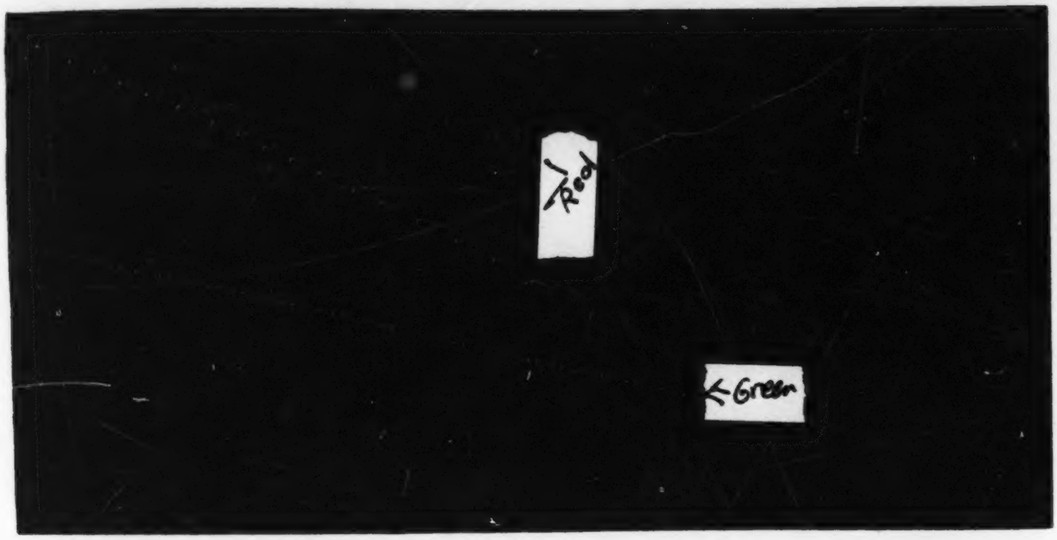
A. An air cushion vehicle underway
B. A power driven vessel greater than 50 meters in length pushing ahead
C. A power driven vessel pushing ahead
D. A seaplane taking off

19.



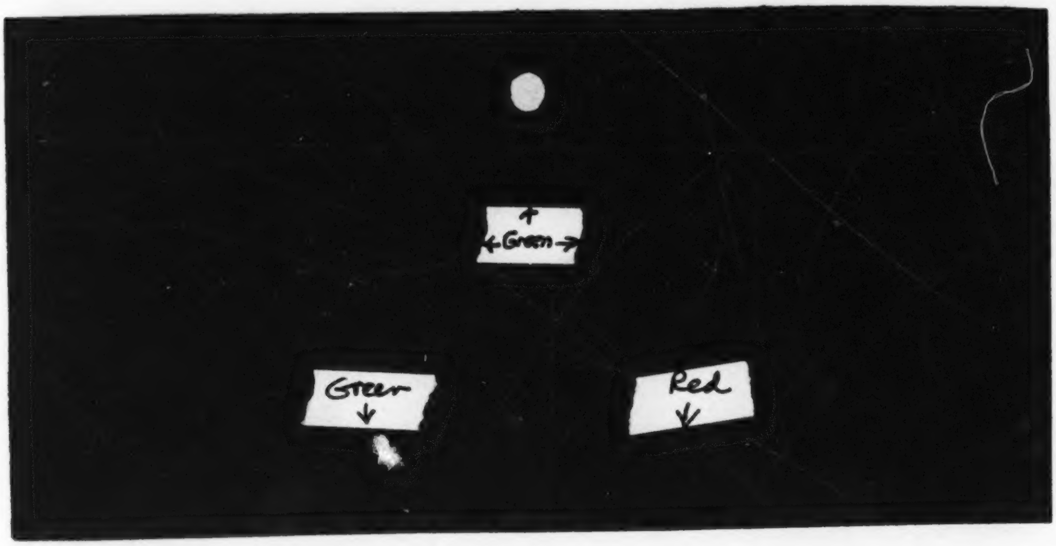
A. A fishing vessel not making way with gear extending 150 ft
B. A vessel trawling not making way
C. A seaplane anchored
D. A power driven vessel towing alongside

20.



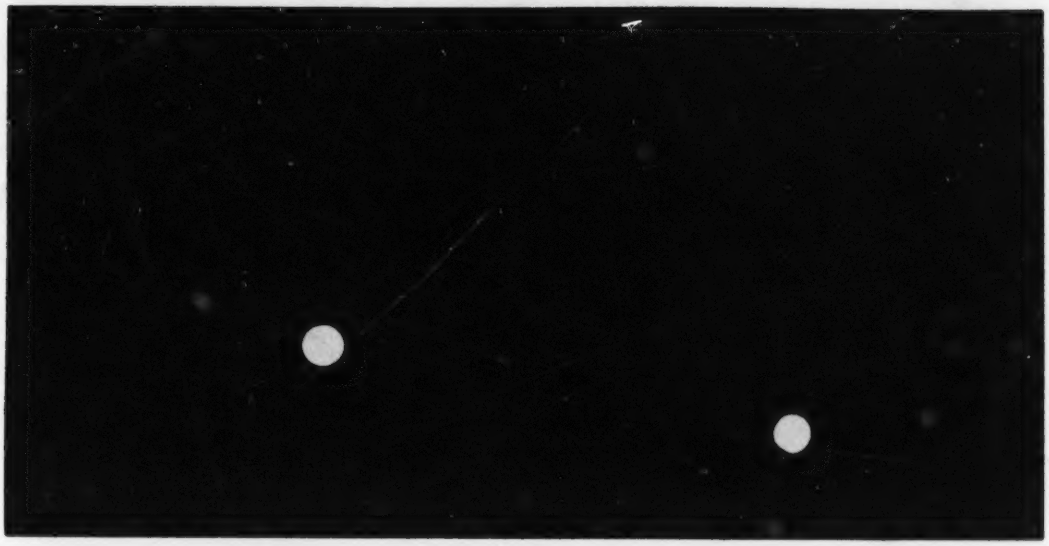
A. A vessel restricted in her ability to maneuver making way
B. A vessel restricted in her ability to maneuver not making way
C. A vessel not under command making way
D. A vessel not under command not making way

21.



A. A vessel trawling
B. A vessel engaged in minesweeping
C. A vessel launching aircraft
D. A vessel conducting underwater operations

22.

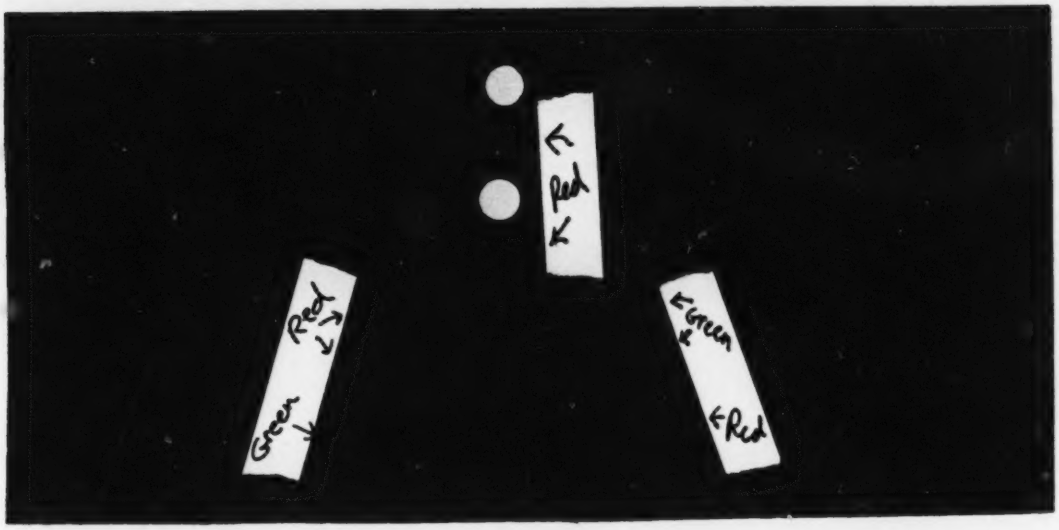


A. A partially submerged towed object
B. Nets extending 150 feet from its vessel
C. A vessel aground
D. A vessel anchored

23.

A. A vessel less than 50 meters in length aground
B. A vessel greater than 50 meters in length aground
C. A vessel less than 50 meters in length restricted in her ability to maneuver anchored
D. A vessel greater than 50 meters in length restricted in her ability to maneuver anchored

24.



A. A vessel restricted in her ability to maneuver with an obstruction to her starboard side
B. A vessel restricted in her ability to maneuver with an obstruction to her port side
C. A vessel anchored with divers operating within 50 meters of her hull
D. A vessel engaged in minesweeping picking up a live mine

25. Which of these vessels is restricted in her ability to maneuver?

A. A vessel launching or recovering aircraft
B. A vessel working an aid to navigation
C. A vessel engaged in dredging operations
D. All of the above

POST TEST ANSWER KEY

1. B
2. A
3. A
4. C
5. D
6. B
7. D
8. B
9. A
10. A
11. B
12. C
13. A
14. D
15. C
16. C
17. B
18. C
19. D
20. C
21. B
22. D
23. A
24. A
25. D

APPENDIX H

REACTION QUESTIONNAIRES

Course Critique

Please, take a few moments to answer these questions. Your answers will help improve the course.

1. How do you rate the instructor?

	Very Effective	Better than Expected	Somewhat Effective	Not Effective
A. Knowledge of Subject	11			
B. Organization & Preparation	10	1		
C. Style & Delivery	10	1		
D. Responsiveness to Participants	9	1	1	
E. Creating appropriate learning climate	8	3		
F. Illustrating & clarifying points	9	1	1	
G. Use of visual aids	11			

2. Overall Instructor Rating

Very Good (11) Good (0) Fair (0) Poor (0)

3. Comments about instructor Gererally very positive, 3 comments concerned too rapid a pace, allow more time to guess at game, allow more time to take notes

4. Did you like the seating arrangement of the classroom?

Yes (6) Uncertain (5) No (0)

5. How do you rate the physical classroom?

Excellent (3) Better than Average (2)

Satisfactory (6) Below Average (0)

6. Were there enough breaks?

Excellent (5) Better than Average (1)

Satisfactory (4) Below Average (0)

End of Course Critique

Please, take a few moments to answer these questions. Your answers will help improve the course.

1. What was your overall reaction to this course?

Excellent (9) Better than Average (0)

Satisfactory (0) Below Average (0)

2. Did you feel that this course met your requirements?

Yes 9
Uncertain ____
No (explain) ____

3. Would you recommend this course to others?

Yes (9) Uncertain (0) No (0)

4. How do you rate the balance of lecture, discussion, and exercises?

Too much lecture (0) Too much discussion (0)

Too many exercises (0) Good balance (9)

5. How helpful were the exercises?

Very helpful (9) Helpful (0) Not helpful(0)

6. How do you feel about the pacing of the course?

Too fast (2) Just right (7) Too slow(0)

7. What did you like best about this course? exercises, instructor rhymes, models, relaxed atmosphere, clear and sensible manner of presentation

8. What did you like least about this course? a full week between classes, length of class too short

9. What should be added to this course? more time, day shapes, continuation of navigation rules, 3rd class for exercises

10. What should be dropped from this course? no comments

11. How do you rate this course's length?

Just right (6) Too long (0) Too short (3)

12. Which term below do you feel best describes the teaching level of this course?

Very difficult (1) Difficult (1) Suitable (6)

Easy (1) Too easy (0)

13. Comment about course content appropriate for length of class, complete but too little time, test easier that material, too heavy a first class session, gained confidence

14. Do you think enough visual aids were used?

Just right (9) Too few (0) Too many (0)

15. How do you rate the quality of the visual aids?

High quality (7) OK (2) Below expectations (0)

16. How do you rate the quality of the handout material?

High quality (7) OK (2) Below expectations (0)

17. Did you think the number of students in the class was:

Just right (8) Too few (0) Too many (0)

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